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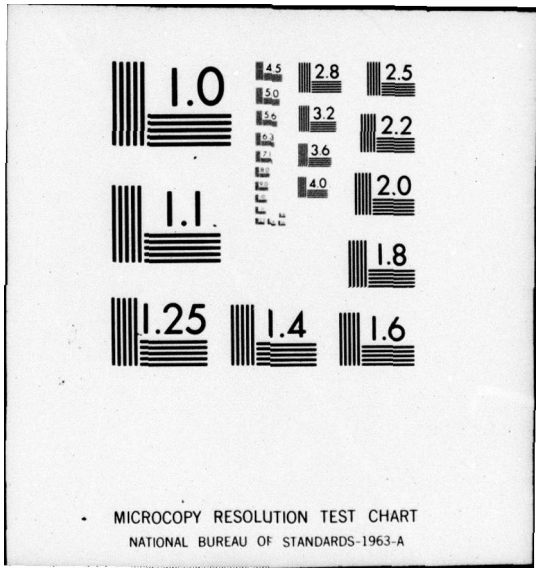
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GENESEE RIVER BASIN STUDY
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AND
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GENESEE RIVER BASIN STUDY.

Volume I.

SUMMARY REPORT.

(9) Final rept.

Study of Water and Related Land Resources.

U.S.
DEPARTMENTS
OF
ARMY_____INTERIOR
AGRICULTURE___COMMERCE
HEALTH, EDUCATION AND WELFARE
and FEDERAL POWER COMMISSION
STATE of NEW YORK
COMMONWEALTH of PENNSYLVANIA

PREPARED FOR THE COORDINATING COMMITTEE: BY
THE BUFFALO DISTRICT, CORPS OF ENGINEERS,
DEPARTMENT OF THE ARMY

(12) 219 p.

(11) JUNE 1969

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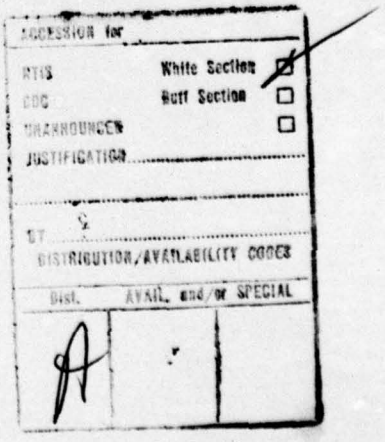
This report of the Genesee River Basin Coordinating Committee was prepared at field level and presents a proposed plan for the development and management of the water and related land resources of the Genesee River Basin and the agricultural management of the Ontario Lake Plain Service Area. This report is subject to review by the interested Federal agencies at the departmental level, by the Governors of the affected States, and by the Water Resources Council prior to its transmittal to the President of the United States for his review and ultimate transmittal to the Congress for its consideration in authorizing Federal participation in implementing the plan.



SYLLABUS

BASIN DESCRIPTION

The Genesee River Basin covers 2,479 square miles, mostly in western New York, with a small portion, 96 square miles in northwestern Pennsylvania. It is roughly elliptical in shape, with a north-south major axis of approximately 100 miles and a maximum width of about 40 miles. The river rises in the Allegheny highlands in Potter County, Pennsylvania, at an elevation of about 2,500 feet, flows approximately 157 river miles in a generally northward direction to its mouth at Rochester Harbor on Lake Ontario, at an elevation of about 247 feet. The topography of the southern portion, the Upper Basin, upstream of Mount Morris Dam, is steep and rugged, while the northern portion, the Lower Basin, is gently rolling. The two major divisions of the basin also closely parallel the two land resource areas which comprise the basin: the Allegheny Plateau and the Ontario Lake Plains Service Area, a region of about 750 square miles north and west of the Basin lying between Rochester and Lockport, New York. This area was included because of its rich agricultural potential and the possibility of supplying it with irrigation water from the Genesee River Basin via the New York State Barge Canal, which traverses the region from west to east and crosses the Genesee on grade at Rochester.

NEEDS OF THE BASIN

The principal needs are for flood protection, water quality control, recreation, fish and wildlife enhancement, irrigation, and agricultural land and water management. The most practicable means to provide for these and other needs of the basin is through a comprehensive plan of structural and non-structural measures.

ECONOMIC DEVELOPMENT

An Economic Base Study was made for the Genesee Basin and the adjoining area that has close economic ties to the basin. This study provided current and projected future population, employment and production indices for use by the several task groups in the study for determining water and water-related resource needs and opportunities for development. The dominance of the Rochester metropolitan area in population, employment, income, industrial production and even in certain sectors of the agricultural economy, is the most significant factor in the basin's economic base. Present trends indicate that the Rochester metropolitan area will closely parallel national growth

and that the other two subareas, the Central Plains and Allegheny Plateau, will continue to lag behind the national growth rates.

PLAN FORMULATION

The objective of this study is to devise a sound program for the development of water and related land resources to meet the immediate and long-range needs of the basin in an orderly, efficient and timely manner.

First, the report is to identify and evaluate in sufficient detail for authorization, any Federal or Federally-assisted projects or programs meeting needs of such immediacy that construction should be initiated within 10 to 15 years after report completion. Second, the report will present a broad, long-range plan to assure best use of basin resources in meeting projected water-related needs through the year 2020. Furthermore, studies of any plan of improvement were to be terminated as soon as it could be established that plan justification would not result. Justification of any project would be required to satisfy criteria established by the Coordinating Committee as follows:

1. Tangible benefits exceed project economic cost;

2. Each separable unit or purpose provides benefits at least equal to its cost;

3. The scope of development is such as to provide the maximum net benefit;

4. There is no more economical means, evaluated on a comparable basis, of accomplishing the same purpose or purposes which would be precluded from development if the plan were undertaken;

5. Where warranted, intangibles will be taken into account which might not otherwise be reflected in the tangible benefits and economic costs; and

6. Federal participation will be recommended in accordance with applicable laws.

In additions to the above criteria the Coordinating Committee made a decision early in the study that projects would be analyzed with standard Corps of Engineers or Soil Conservation Service criteria without recourse to criteria devised for special programs or objectives.

PUBLIC HEARINGS

Two public hearings were held by the Coordinating Committee in October, 1967, to present the early-action plan to the residents of the basin. The plan was accepted, in general, with one exception, the multiple-purpose Portage Project. Because of inadequate support at both public hearings, the Coordinating Committee has placed the project in a "Deferred Plan" category for future evaluation.

RECOMMENDED BASIN PLAN AND COST

As a result of the basin study and reaction at the public hearings, the Coordinating Committee recommends the following early-action, deferred and long range plans for the Genesee River Basin and Ontario Lake Plain Service Area:

Development	Estimated Total Cost	Estimated Cost Federal Participation
EARLY-ACTION PLAN		
33 Upland Reservoir Sites	$29,535,000(1)	$14,165,000(1)
Land Treatment	12,911,000	---
Canaseraga Multiple-purpose	7,699,000	6,865,000
Flood Plain Management (Black Creek)	26,000	26,000
Hemlock Lake Recreation Area	(2)	(2)
Canadice Lake Recreation Area	(2)	(2)
8 Recreation Access Sites	1,600,000	800,000
"3-River Rise", Natural History Area	300,000	150,000
Conesus Lake Wetland Area	540,000	270,000
Honeoye Lake Wetland Area	1,000,000	500,000
SUBTOTAL BASIN	$53,611,000	$22,776,000
29 Reservoirs-Ontario Lake Plains	5,185,000	2,593,000
SUBTOTAL EARLY-ACTION PLAN	$58,796,000	$25,369,000
APPALACHIA PROGRAM		
Stannard Multiple-purpose Reservoir (3)	37,500,000	31,352,000
TOTAL EARLY-ACTION PLAN	$96,296,000	$56,721,000
DEFERRED PLAN		
Portage Reservoir	$96,800,000	
LONG RANGE PLAN		
Tuscarora Reservoir	$16,490,000	
Wiscoy Reservoir	16,000,000	
Oatka Reservoir	16,300,000	
67 Upland Reservoir Sites	64,450,000	
Land Treatment	28,260,000	
Finger Lakes Trails (additions)	1,000,000	
Alma Pond, Natural Area	150,000	

(1) If Stannard multiple-purpose reservoir is constructed, one Upland Reservoir site would be deleted, refer to "Additions to Summary Report," making "Estimated Total Cost" $27,341,000 and "Federal Participation" $13,068,000

(2) No estimate

(3) Cost based on project formulation by Water Development Committee for Appalachia

It is also recommended that this basin report be used as a supporting document for project authorization requests submitted by construction agencies; that the basin plan be periodically updated to ensure its currency; and that approval or acceptance of the plan not constitute a bar to development of projects and programs not included in the plan.

IMPLEMENTATION OF BASIN PLAN

Three of the thirty-three upland reservoir sites and twenty-nine reservoirs in the Ontario Lake Plains Service Area are recommended for construction by the Soil Conservation Service under authority of Public Law 566. The Land Treatment program should be implemented by the proper agencies of Department of Agriculture in accordance with existing law.

The Corps of Engineers should request authorization through proper channels for the Canaseraga multiple-purpose project.

The Corps of Engineers has prepared at the request of the towns involved through the New York State Conservation Department a Flood Plain Information Report for Black Creek as recommended by the Genesee River Basin Coordinating Committee.

The Genesee Basin Regional Water Resources Planning Board of the State of New York should reevaluate the multiple-purpose Portage Project to determine whether the project should be considered for early-action, long range or deferred indefinitely. The Board should take the lead in development of the other items of the early-action plan which are outside the authority of the Federal Government.

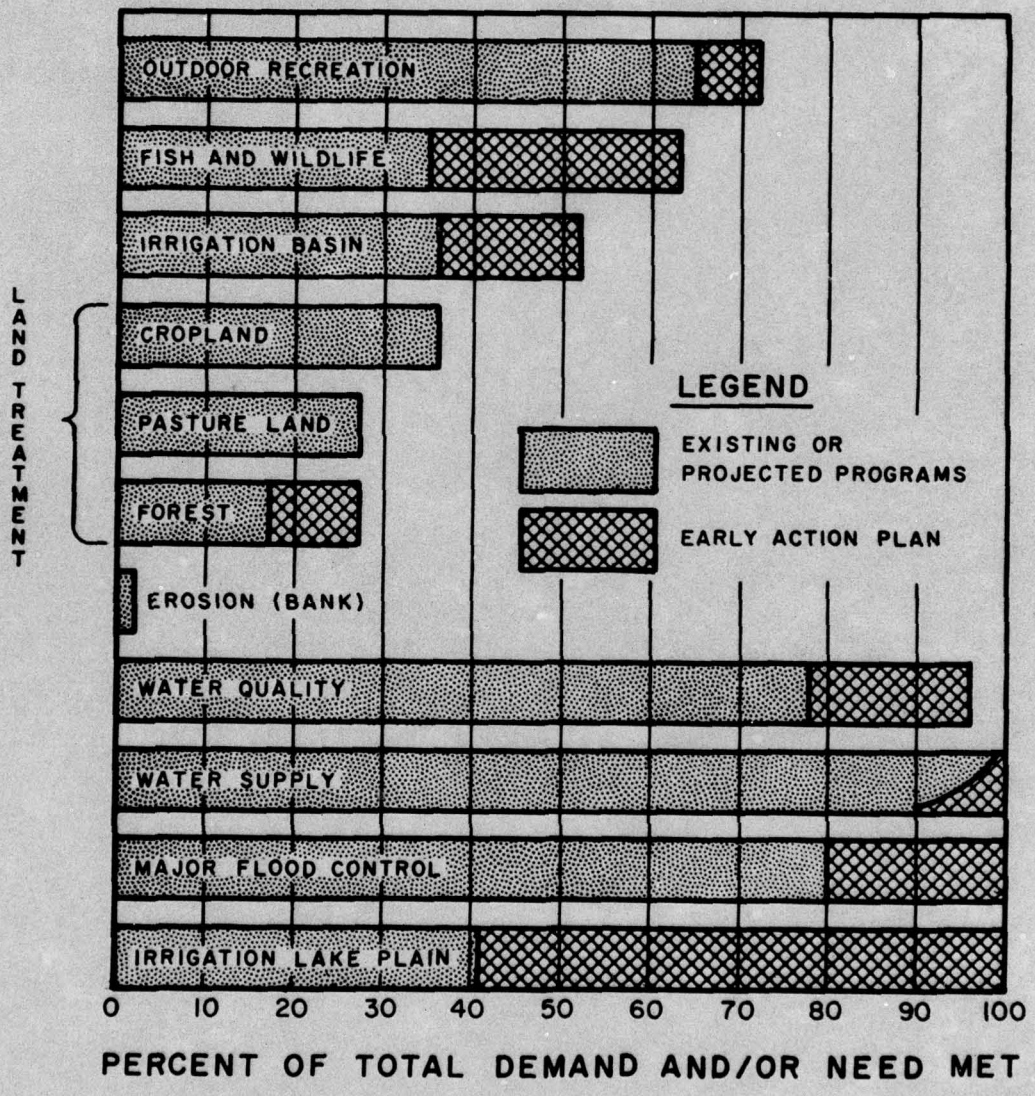
The Department of Agriculture should pursue their request that the Secretary of Agriculture be given authority to carry out the upland reservoir program, thirty sites, which are not presently within the scope of Public Law 566. The Genesee Basin Regional Water Resources Planning Board should take necessary action to implement these twenty-nine early-action upland reservoir sites within New York State.

IMPACT OF THE BASIN PLAN

It should be fully understood that the "Early-Action" plan does not meet all of the projected demands and/or needs of the Genesee Basin. It should serve as a guide for the orderly development of the water and related land resources of the Basin.

The principal unmet demands are in the fields of outdoor recreation, fish and wildlife, irrigation within the Basin, land treatment and main channel bank erosion. The needs in the fields of water supply, water quality, major flood control and irrigation within the Ontario Lake Plain Service Area have been sufficiently met. The following graph illustrates the impact of the "Recommended Plan" on the demands and/or needs of the Basin.

IMPACT OF EARLY ACTION PLAN ON 1980 DEMANDS AND/OR NEEDS



GENESEE RIVER BASIN STUDY

SUMMARY REPORT

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INTRODUCTION

1. AUTHORITY

A comprehensive study for the Genesee River Basin was authorized by the Committee on Public Works of the United States Senate in a resolution adopted 1 February 1962. The overall study was requested by the New York State Water Resources Commission and the authorizing resolution was sponsored by Senator Jacob K. Javits of New York.

2. The authorizing resolution for the overall study reads:

> "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors created under Section 3 of the River and Harbor Act approved 13 June 1902, be and is hereby requested to review the reports of the Genesee River, New York contained in House Document 615, 78th Congress, 2nd Session, and other reports, with a view to determining whether any modification of the basin-wide plans should be made at this time with respect to improvements for flood control, navigation, and other related water and land resources. In making this study the Corps of Engineers shall coordinate fully with the State of New York and Commonwealth of Pennsylvania and other Federal agencies concerned to insure full consideration of all views and requirements of all interrelated programs, which those agencies may develop with respect to flood prevention, water supply, stream pollution abatement, recreation, fish and wildlife management, irrigation, soil conservation, hydro-electric power and related water and land resources."

3. This comprehensive study was initiated by the Corps of Engineers in accordance with the above resolution. Shortly after initiation, the study was selected as one of the original sixteen Type II river basin studies by the Interdepartmental Staff Committee for completion in the late 1960's. The Water Resources Planning Act (Public Law 89-80) was subsequently approved 22 July 1965 which established the Water Resources Council. It is now the function of the Council to effectuate the policy of the United States, as stated in the Water Resources Planning Act, to encourage the conservation, development and use of water and related land resources of the United States. This is to be done on a comprehensive and coordinated basis by the Federal Government, States, localities and private enterprise acting together. Thus, the Genesee study came under the jurisdiction of the Council. Figure 3 shows all the agencies involved in the study.

4. The United States Department of Agriculture participated in the study under the authority contained in Section 6 of Public Law 566, 83rd Congress, as amended. The work was carried out for the United States Department of Agriculture in accordance with the "Memorandum of Understanding," dated 2 February 1956, between the Soil Conservation Service, Forest Service and Economic Research Service.

5. The United States Department of the Interior, Federal Water Pollution Control Administration initiated their portion of the study as the Public Health Service, Department of Health, Education and Welfare. They participated in the study under the authority of the Federal Water Pollution Control Act, Public Law 660, 84th Congress, as amended by Public Law 87-88 (33 U.S.C. 466 et seq.); and the "Memorandum of Agreement," dated 4 November 1958 between the Department of Army and the Department of Health, Education and Welfare, relative to the Water Supply Act of 1958, Public Law 500, 85th Congress, as amended by Public Law 87-88 (43 U.S.C. 390b).

6. The United States Department of the Interior, Bureau of Outdoor Recreation participated in the study under the authority contained in their Bureau's Organic Act, Public Law 88-29, May 1963 (77 Stat. 49).

7. The United States Department of the Interior, Bureau of Sport Fisheries and Wildlife participated in the study under the authority of the Fish and Wildlife Coordination Act, Public Law 85-624 (28 Stat. 401 as amended; 16 U.S.C. 661-666 inc.), in cooperation with the New York State Conservation Department.

8. OBJECTIVES

The basic objective of this report is to present a comprehensive plan of development for the Genesee River Basin to provide the best use, or combination of uses, of water and related land resources to meet all foreseeable short and long-term needs. In pursuit of this basic conservation objective, consideration was given to each of the following objectives and reasoned choices made between them when they conflict:

a. Development: National economic development, and development of each region within the country, is essential to the maintenance of national strength and the achievement of satisfactory levels of living. Related water and land resources development and management are essential to economic development and growth, through concurrent provision for:

(1) Adequate supplies of surface and ground waters of suitable quality for domestic, municipal, agricultural, and industrial uses;

(2) Water quality facilities and controls to insure water of suitable quality for all reasonable water uses;

(3) Hydroelectric power where its provision can contribute advantageously to a needed increase in power supply;

(4) Flood control or prevention measures to protect people, property, and productive lands from flood losses where such measures are justified and are the best means of avoiding flood damage;

(5) Land stabilization measures where feasible to protect land for beneficial purposes;

(6) Drainage measures where the best use of land would be justifiably obtained;

(7) Watershed protection and management measures where they will conserve and enhance resource use opportunities; and

(8) Outdoor recreational and fish and wildlife opportunities where these can be provided or enhanced by development works.

b. Preservation: Stewardship in the long-term interest of natural beauty requires in particular instances that:

(1) There be protection and rehabilitation of resources to insure availability for their best use when needed;

(2) Open space, green space, lakes, beaches, and related land areas be maintained and used for recreational purposes; and

(3) Areas of unique natural beauty and historical interest be preserved and managed primarily for the inspiration, enjoyment and education of the people.

c. Well-being of people: Well-being of the people shall be the overriding determinant in considering the best use of water and related land resources. Hardship and basic needs of particular groups within the general public shall be of concern, but care shall be taken to avoid resource use and development for the benefit of few or the disadvantage of many. Policy requirements and guides established by the Congress will be observed, in particular, those aimed at safeguarding the interests of all our people in assuring that the best use will be made of our natural resources.

9. STUDY SCOPE

This report presents a general appraisal of the water and related land resource potential and needs for the Genesee River basin and the agricultural potential of the adjoining Ontario Lake Plains Service Area.

It includes the projections of future conditions and needs of the region, State and localities, developed by the Economic Base Study. The economic projections have been translated by the several study task groups into demands for water and related land resources in their special fields of interest.

10. The basic policies of this comprehensive report were governed by Senate Document No. 97, 87th Congress, 2nd Session. In the absence of guidelines for Type II studies, it was the consensus of the Coordinating Committee that the "Guidelines for Framework Studies," by the Inter-departmental Staff Committee, ad hoc Water Resources Council, dated 10 June 1965 should be considered where applicable. In cases where the guidelines did not appear applicable, the general format of a typical Corps of Engineers report was followed.

11. This comprehensive report is a Type II study which has two major objectives. First, the report identifies and evaluates in sufficient detail for authorization, any Federal or Federally-assisted projects or programs meeting needs of such immediacy that construction should be initiated within 10 to 15 years after report completion. Second, the report presents a broad, long-range plan to assure best use of the basin resources in meeting projected water-related needs through the year 2020. Furthermore, in order to minimize refinement studies, all participating agencies were to terminate studies at the point where it became apparent that justification would not result. Justification of any project was required to satisfy criteria as follows:

a. Tangible benefits exceed project economic costs;

b. Each separable unit or purpose provides benefits at least equal to its costs;

c. The scope of development is such as to provide the maximum net benefits;

d. There is no more economical means, evaluated on a comparable basis, of accomplishing the same purpose or purposes which would be precluded from development if the plan were undertaken;

e. Where warranted, intangibles will be taken into account which might not otherwise be reflected in the tangible benefits and economic costs; and

f. Federal participation will be recommended in accordance with applicable laws.

12. The Department of Agriculture, in addition to their studies in the Genesee River basin, conducted studies in the adjoining Ontario Lake Plain Service Area. This area was included owing to the potential for storing water in the Genesee basin for irrigation use in the Lake Plains Service Area. The results and recommendations of these additional studies are included in our basin plan and in Appendix "J," Agricultural Studies, Volume VI.

13. PRIOR REPORTS AND INVESTIGATIONS

While the records of floods on the Genesee River date back to 1800, no study of remedial measures was undertaken until after the extensive damage in 1865. Following the great flood of 1865 a series of studies and reports on flood control measures were made by Governmental agencies and by private interests. Periodic investigations have also been made of sites for water supply and power development projects. In 1889-1893 the State of New York investigated the possibility of reservoirs on the Genesee River for water supply for the Erie Canal. The first sites studied included several in the Mount Morris Gorge, but owing to the development of other water supply sources for the canal the State of New York did not proceed with development of reservoirs on the Genesee River.

14. In 1905 a special committee was appointed by the Mayor of Rochester, and another committee by the Chamber of Commerce to investigate and report on flood conditions. A report was submitted covering the history of previous floods and suggesting remedies. In 1928 the City Manager of Rochester enlarged the scope of an investigation for a Civic Center for the City of Rochester to include the general subject of flood protection. A detailed report referred to as the "Fisher Report" on flood conditions was published in 1937.

15. The Water Supply Commission of the State of New York, between the years 1907-1910 made a study of the Genesee River for flood control and power. Two sites were found for multiple-purpose reservoirs, one near Mount Morris and other near Portageville. The former New York State Water Pollution Control Board published Survey Report No. 1 and No. 2 entitled the "Upper" and "Lower Genesee River Drainage Basin," in 1955 and 1961 respectively. These reports recommended classification and assigned standards of quality and purity for various reaches of the tributaries and main stem of the Genesee River. The New York State Water Resources Commission in November 1963, prepared a preliminary investigation of Conesus Lake Basin.

16. In 1923-1926 the Rochester Gas and Electric Corporation acquired land in the present Mount Morris Reservoir area for future construction

of a dam and power plant at a site approximately one-quarter mile downstream of the present site. The corporation deeded to the State of New York, for park purposes, excess lands not required for the reservoir. In 1927 the Commonwealth Power Company applied to the Conservation Department of the State of New York for a license to develop power on the Genesee River in the vicinity of Portageville. This application was rejected, as a clause in the grant to Letchworth Park lands to the State stipulated that these lands were to be used for park purposes in perpetuity.

17. Existing Federal projects and studies in the Genesee River Basin shown on figure 1 (by the Corps of Engineers, unless otherwise noted) are as follows:

a. A preliminary examination and survey for flood control on the Genesee River was authorized under Section 6 of the Flood Control Act, Public Law 738, 74th Congress, approved 22 June 1936. This survey report dated 16 May 1941 and published in House Document No. 615, 78th Congress, 2nd Session, recommended construction of an earth-fill dam in the Genesee River near Mount Morris;

b. A proposed plan for development of the Genesee River Basin by the Federal Power Commission was prepared February 1943;

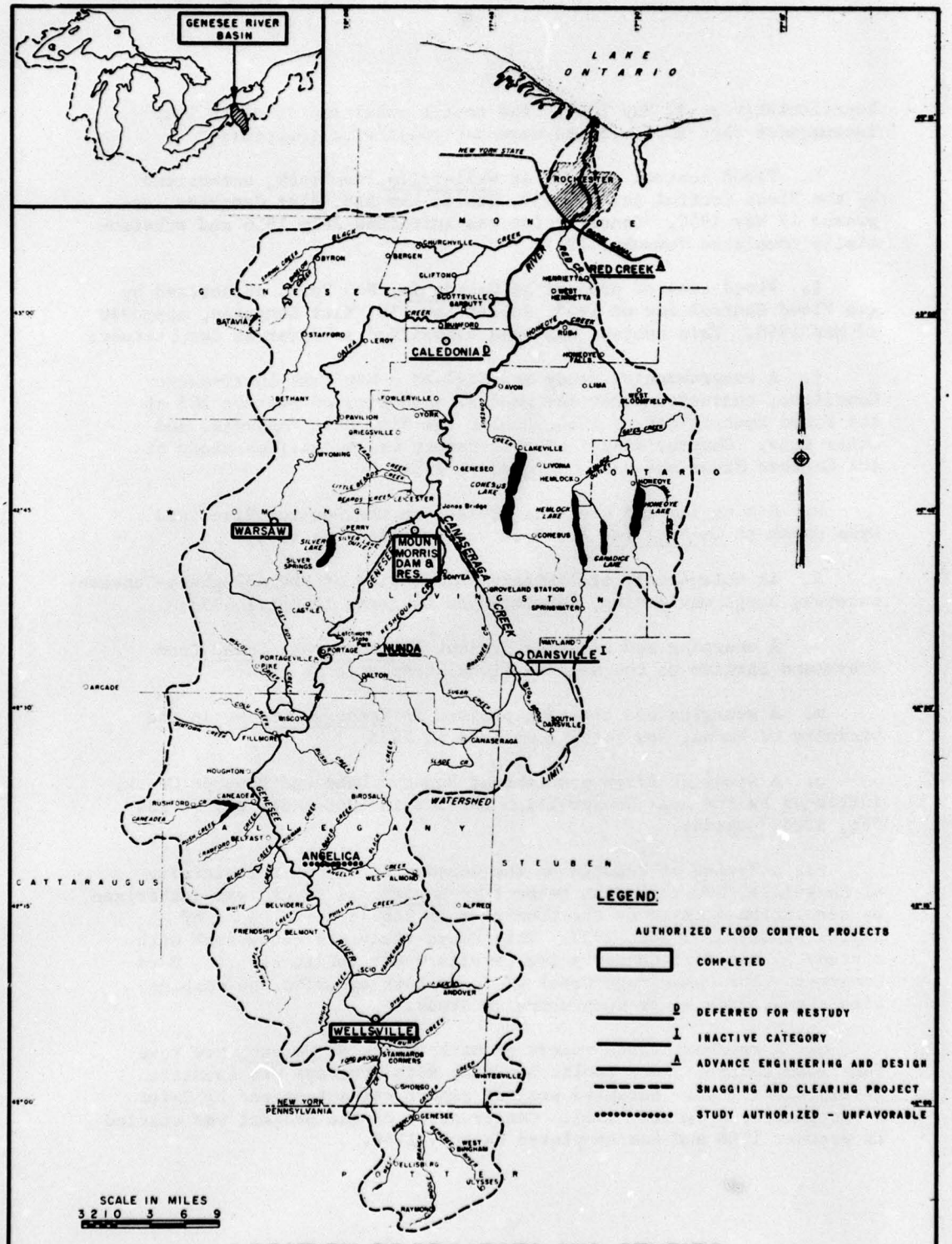
c. Mount Morris Dam and Reservoir authorized by Section 10 of the Flood Control Act, Public Law 534, 78th Congress, approved 22 December 1944. Construction was initiated in March 1948 and completed in 1952;

d. A survey report dated 30 July 1945 and published in House Document No. 206, 80th Congress, 1st Session, recommended channel improvements in Canaseraga Creek for flood control in the vicinity of Dansville, New York;

e. Flood control project at Dansville and Vicinity, New York was authorized by the Flood Control Act of 1948, Public Law 858, 80th Congress, approved 30 June 1948. This project has been placed in an inactive category;

f. A survey report dated 12 March 1948 and published in House Document No. 232, 81st Congress, 1st Session, recommended channel improvements for flood control at Wellsville and Caledonia, New York;

g. A Review of Reports on the Genesee River with particular reference to Angelica Creek, Allegany County, New York, was authorized by resolution adopted by the Committee on Public Works House of



LOCATION OF PROJECTS AND STUDIES
FOR
GENESEE RIVER BASIN

FIGURE 1

Representatives, 27 May 1949. The report submitted 18 March 1955 recommended that improvements were not considered justified;

h. Flood control project at Wellsville, New York, authorized by the Flood Control Act of 1950, Public Law 516, 81st Congress, approved 17 May 1950. Construction was initiated July 1956 and substantially completed November 1957;

i. Flood control project at Caledonia, New York, authorized by the Flood Control Act of 1950, Public Law 516, 81st Congress, approved 17 May 1950. This project has been classified as deferred for restudy;

j. A comprehensive study New England - New York Inter-Agency Committee, conducted under the general authority of Section 205 of the Flood Control Act of 1950, Public Law 516, 81st Congress, and other acts. Chapter XXXIII of this report was a detailed study of the Genesee River and was completed in 1954;

k. A snagging and clearing project on the Genesee River and Dyke Creek at Wellsville, New York was completed in 1951;

l. An unfavorable preliminary examination of the Allegheny-Genesee waterway barge navigation, submitted to Congress 13 April 1953;

m. A snagging and clearing project in Canaseraga Creek from Groveland Station to the Genesee River, completed in 1954;

n. A snagging and clearing project in Keshequa Creek, in the vicinity of Nunda, New York, completed in 1955;

o. A study of flood problems at Honeoye Lake and Honeoye Creek, initiated by the Soil Conservation Service in 1958 under Public Law 566, 83rd Congress.

p. A Review of Reports on the Genesee River, in the vicinity of Dansville, New York with respect to Canaseraga Creek, was authorized by resolution adopted by the Committee on Public Works House of Representatives, 3 June 1959. This Corps study was concurrent with a study by the Soil Conservation Service under Public Law 566, 83rd Congress. The Canaseraga Creek study by both agencies was combined with the Genesee River Comprehensive Study.

q. A reconnaissance report on Oatka Creek at Warsaw, New York for flood control under Public Law 685, 84th Congress was submitted 27 September 1960. Detailed project report was authorized by Chief of Engineers, 6 January 1961. Construction of the project was started in October 1966 and was completed 24 July 1968.

r. A design memorandum for rectification of deficiencies in completed local flood protection project Wellsville, New York was authorized by Office, Chief of Engineers, 22 March 1962. The report was submitted to higher authority 22 April 1966; and

s. Flood control project Red Creek, Monroe County, New York was authorized by the Rivers & Harbors Act of 1966, Public Law 89-789, approved 7 November 1966. This project was initiated by the Soil Conservation Service in 1961 under authority of Public Law 566, 83rd Congress, and the Corps of Engineers was requested to participate in October 1961 under authority of Public Law 685, 84th Congress. As the study developed, the scope of the project exceeded the limitations of Public Law 685, 84th Congress, and the study was transferred by authority Office, Chief of Engineers, 20 March 1963 to the Genesee River Basin Comprehensive Study. An interim report was submitted in August 1965 and published in Senate Document No. 107, 89th Congress, 2nd Session.

t. A joint Federal-State pollution study that included the Genesee River Basin was the Great Lakes-Illinois River Basins Project. This project began studying the Lake Ontario Basin in 1964 under authority of Section 3(a) of Public Law 84-660, as amended. The project report is "Lake Ontario and St. Lawrence River Basins, Water Pollution Problems and Improvement Needs, June 1968."

18. COORDINATING COMMITTEE

Under the Senate Resolution authorizing the study, the Corps of Engineers was directed to coordinate fully with the State of New York and the Commonwealth of Pennsylvania and other Federal agencies concerned to assure conduct of a comprehensive survey and development of a plan for the efficient utilization of the water and related resources of the Genesee River Basin. Therefore, a Coordinating Committee was initiated to provide an organization for full and continuing exchange of views during the study; advise and assist all participating agencies with regard to objectives, work assignments and schedules; assist in the resolution of study problems as they arose; and make periodic review of progress.

19. The Secretary of the Army, Cyrus R. Vance, assigned the responsibility for the investigation to the District Engineer, Buffalo District and designated him Chairman of the Coordinating Committee. The Secretaries of the following Federal departments were requested by the Secretary of the Army by letter dated 27 November 1962 to designate one formal representative and an alternate to represent all agencies of their department; Interior, Agriculture, Commerce, Health, Education and Welfare and the Federal Power Commission.

20. The Governors of New York and Pennsylvania were requested by the Division Engineer, North Central Division, Brigadier General T. De F. Rogers, by letter dated 17 December 1962, to designate a formal representative and alternate for the Coordinating Committee.

21. The several Secretaries and Governors complied with the request to designate formal representatives. Figure 2 shows the membership of Coordinating Committee as originally constituted and all changes in membership that occurred as the study progressed.

22. STUDY ASSIGNMENTS

In order that the major tasks and technical studies could be performed efficiently and the several appendices be prepared by personnel having the technical competence in a given field, the study was divided into thirteen task groups. The Coordinating Committee assigned one agency to chair and several cooperating agencies to each of the task groups. In general the chairing or responsible agency was selected whose normal operating authority related to the given task. All other agencies having an interest in the field were invited to be cooperating agencies. The organization of the study, the task groups and the agencies involved in each are shown on figure 3.

23. The task groups consisted principally of personnel at the working level and were governed by guidelines established by the Coordinating Committee. These guidelines and a detailed description of the work items of each task group are contained in Appendix "A," Volume II of this study. Table 1 lists the task groups in the study and the responsible agency for each.

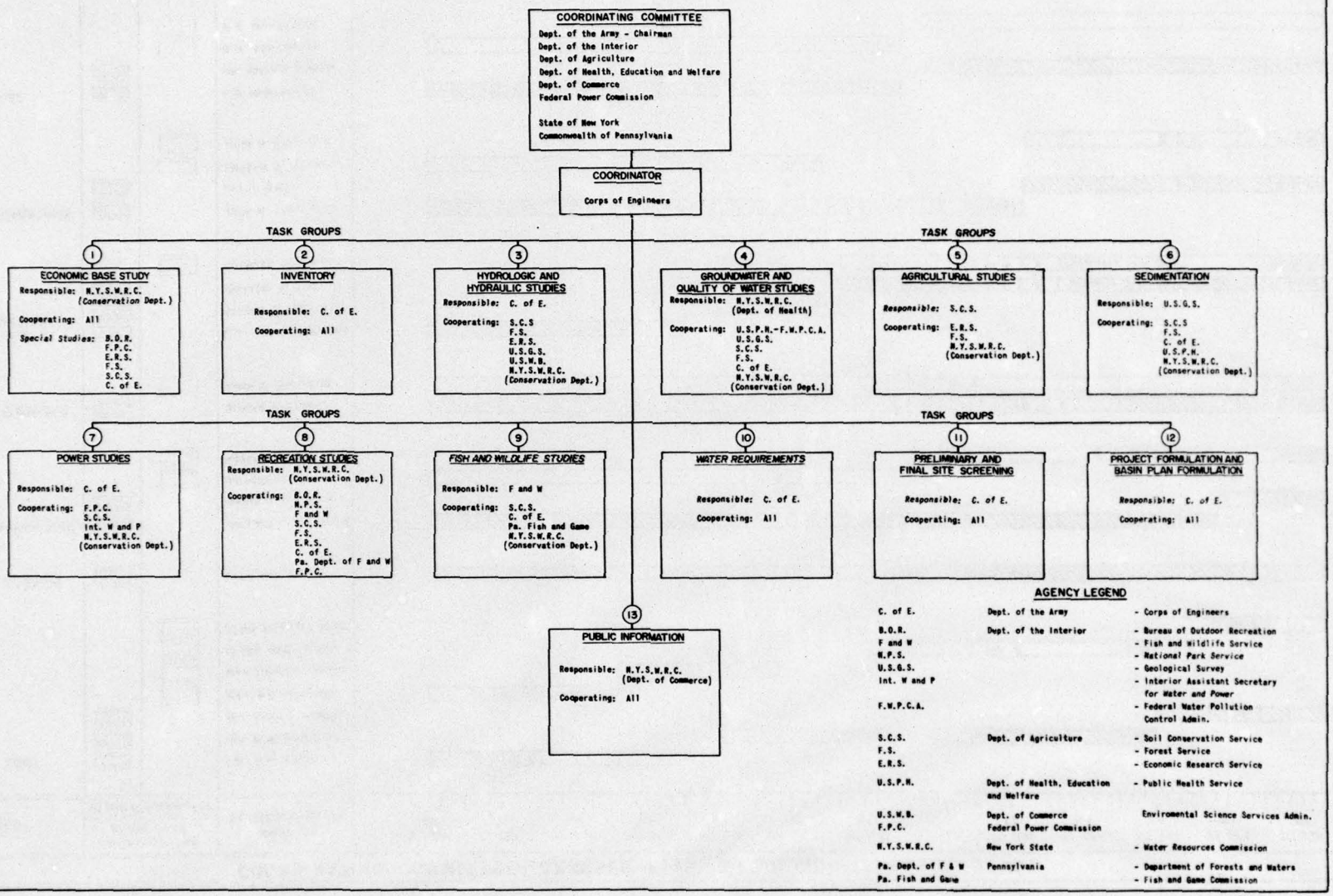
COORDINATING COMMITTEE – GENESEE RIVER BASIN COMPREHENSIVE STUDY

DEPARTMENT	COORDINATING COMMITTEE MEMBER	COORDINATING COMMITTEE ALTERNATE	NAME OF REPRESENTATIVE	30 JUN. '69	31 DEC. '68	30 JUN. '68	31 DEC. '67	30 JUN. '67	31 DEC. '66	30 JUN. '66	31 DEC. '65	30 JUN. '65	31 DEC. '64	30 JUN. '64	31 DEC. '63	30 JUN. '63
DEPARTMENT OF ARMY	▨		COL. A. L. WRIGHT					C. OF E.								
	▨		COL. R. WILSON NEFF													
	▨		COL. LEON J. HAMERLY													
		□	MAJ. B.R. SCHLAPAK													
		□	MAJ. LINWOOD LUFKIN													
		□	LT. COL. JAMES M. NEIL													
		□	LT. COL. WILLIAM F. PENCE													
DEPARTMENT OF INTERIOR	▨		MARK ABELSON													
DEPARTMENT OF AGRICULTURE	▨		WALLACE L. ANDERSON													
	▨		IRVING B. STAFFORD													
		□	RICHARD HOGUE													
		□	ROBERT D. PERRY													
DEPARTMENT OF COMMERCE	▨		GEORGE E. KIRK													
		□	JOHN M. WILLIAMS													
DEPARTMENT OF HEALTH EDUCATION AND WELFARE	▨		R.J. VAN DERWERKER													
	▨		SYLVAN C. MARTIN													
	▨		WILLIAM Q. KEHR													
		□	CHARLES R. OWNBEY													
FEDERAL POWER COMMISSION	▨		JOHN H. SPELLMAN													
	▨		DAY J. WAIT													
		□	ANGELO M. MONACO													
		□	JOHN H. SPELLMAN													
STATE OF NEW YORK	▨		F. W. MONTANARI													
	▨		DR. HAROLD G. WILM													
		□	N.W. BARBAROSA													
		□	F. W. MONTANARI													
COMMONWEALTH OF PENNSYLVANIA	▨		MAURICE K. GODDARD													
		□	A. J. SOMMERVILLE													

FIGURE 2

FIGURE 2

GENESEE RIVER BASIN COMPREHENSIVE STUDY
ORGANIZATION CHART



REVISED 6-30-69

FIGURE 3

TABLE 1 - Task groups

Task Number	Name	Agency Responsible
1	Economic Base Study	New York State Water Resources Commission
2	Inventory	Corps of Engineers
3	Hydrologic and Hydraulics Studies	Corps of Engineers
4	Groundwater and Quality of Water Studies	New York State Water Resources Commission
5	Agricultural Studies	Soil Conservation Service
6	Sedimentation	Geological Survey
7	Power Studies	Corps of Engineers
8	Recreation Studies	New York State Water Resources Commission
9	Fish and Wildlife Studies	Fish and Wildlife Service
10	Water Requirements	Corps of Engineers
11	Preliminary and Final Site Screening	Corps of Engineers
12	Project and Basin Plan Formulation	Corps of Engineers
13	Public Information	New York State Water Resources Commission

24. The work assignments of several of the above task groups included the preparation of technical appendices covering their specific areas of interest.

25. The Corps of Engineers, as the chairman agency, was assigned the responsibility of preparing the summary report and all appendices not assigned to a Task Group as shown in table 1. The Corps of Engineers, under the direction of the Coordinating Committee, also, was assigned the responsibility of printing and distributing the summary report and all appendices regardless of the Task Group that prepared the appendix.

26. The final basin report has been divided into several volumes of reasonable size in accordance with the ISC Guidelines of 10 June 1965. The summary report and fourteen appendices has been printed and bound in eight volumes as shown in table 2.

TABLE 2 - Basin report by volumes

Volume	Appendix	Title	Task Group or Agency Responsible
I	-	Summary Report	Corps of Engineers
II	A	History	Corps of Engineers
	B	Plan Formulation	#10, 11 & 12
	C	Project Designs and Cost Estimates	11
III	D	Economic Base Study	1
IV	E	Hydrology	3
	F	Flood Control	3
V	G	Water Laws	New York & Pennsylvania
	H	Water Supply and Water Quality Management	4
	I	Groundwater Resources	4
VI	J	Agricultural Studies	5
	K	Sedimentation	6
VII	L	Hydroelectric Power	7
	M	Outdoor Recreation	8
	N	Fish and Wildlife	9
VIII	-	New York State Supplement to the Water Resources Investigations of the Genesee Basin Coordinating Committee Study	New York

27. During the latter stages of the basin study it was recognized by the Coordinating Committee that owing in part to insufficient funds, personnel restraints and deadline dates only a limited number of alternatives could be investigated. In view of this development, the New York State Conservation Department, Division of Water Resources entered into a contract with Harza Engineers to conduct supplementary investigations in the basin. These studies were to evaluate required

development potential in the basin in addition to that identified by the Coordinating Committee. The results of the additional investigations are contained in the "New York State Supplement to the Water Resources Investigations of the Genesee Basin Coordinating Committee," published as Volume VIII of the basin report. These studies indicate that besides the projects included in the early-action plan, additional early-action measures may be feasible. Areas needing further evaluation are also indicated.

28. STUDY AREAS

It was determined at the outset of the study that it would be impossible for the several Task Groups to isolate just the Genesee River Basin for their individual investigations. Therefore, different study areas had to be delineated as shown in figure 4 which had a pronounced influence or impact on that particular study. The Ontario Lake Plain Service Area is the exception to the general case. Although outside the Genesee River watershed, it was included in Department of Agriculture studies for irrigation purposes because of the relationship of the water supply potential between the Barge Canal and the Genesee River. Table 3 shows the county included for the different study purposes.

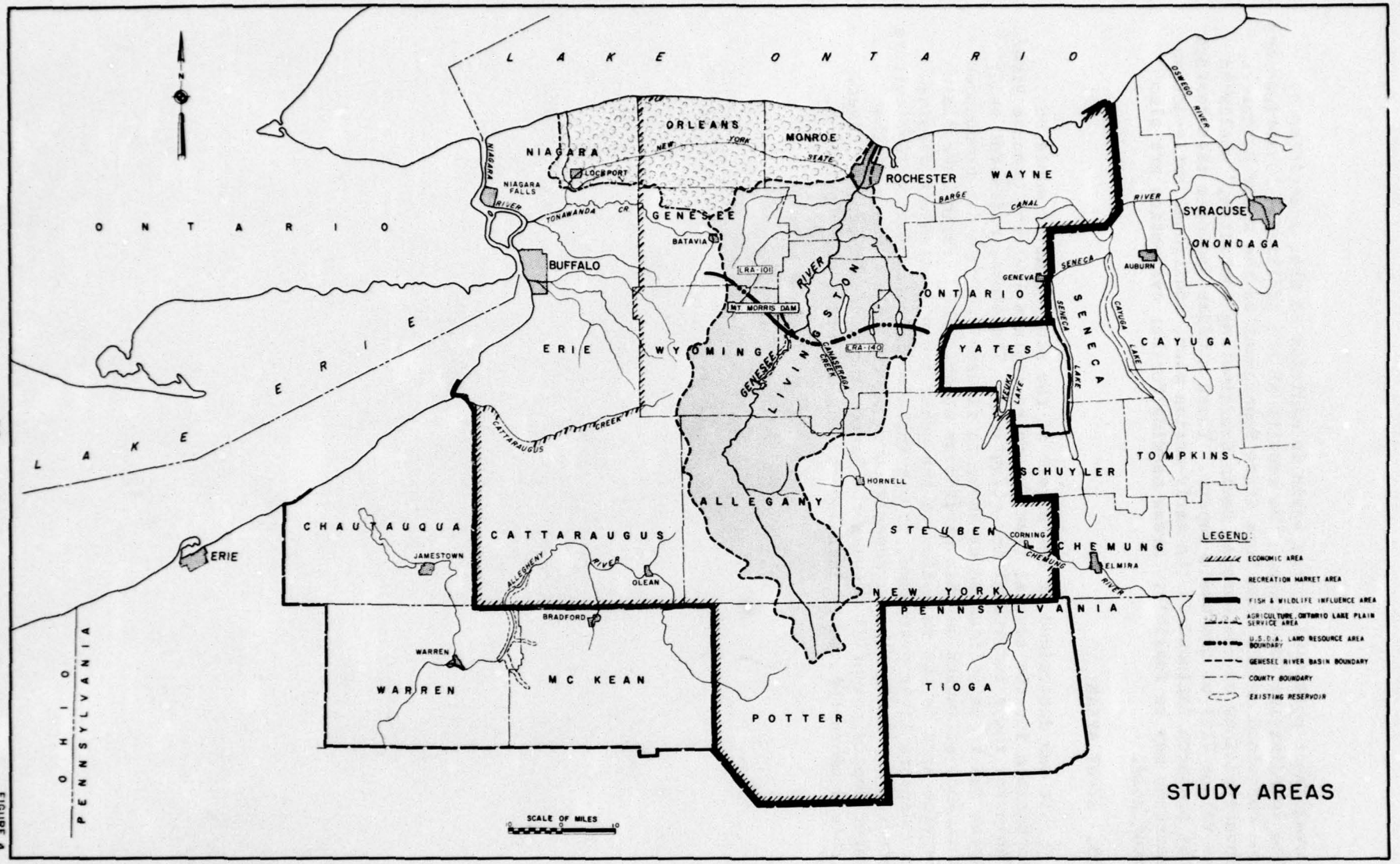

LAKE ONTARIO
ONTARIO
LAKE ERIE
PENNSYLVANIA
OHIO
NEW YORK
ORLEANS
MONROE
NIAGARA
WAYNE
ROCHESTER
LOCKPORT
NIAGARA FALLS
NIAGARA RIVER
TONAWANDA CR
GENESEE
BATAVIA
BUFFALO
ERIE
WYOMING
LIVINGSTON
GENESEE RIVER
LRA-101
MT MORRIS DAM
LRA-140
CANASERAGA CREEK
CATTARAUGUS CREEK
ONTARIO
GENEVA
YATES
SENECA
SENECA LAKE
CAYUGA LAKE
SENECA RIVER
BARGE CANAL
OSWEGO RIVER
SYRACUSE
ONONDAGA
AUBURN
CAYUGA
KEUKA LAKE
SCHUYLER
TOMPKINS
HORNELL
ALLEGANY
CHAUTAUQUA
CATTARAUGUS
JAMESTOWN
ALLEGHENY RIVER
OLEAN
BRADFORD
STEUBEN
CORNING
CHEMUNG
ELMIRA
CHEMUNG RIVER
WARREN
MC KEAN
POTTER
TIOGA
SCALE OF MILES
LEGEND:
ECONOMIC AREA
RECREATION MARKET AREA
FISH & WILDLIFE INFLUENCE AREA
AGRICULTURE, ONTARIO LAKE PLAIN SERVICE AREA
U.S.D.A. LAND RESOURCE AREA BOUNDARY
GENESEE RIVER BASIN BOUNDARY
COUNTY BOUNDARY
EXISTING RESERVOIR
STUDY AREAS

FIGURE 4

TABLE 3 - Study Areas by County and Purpose

County	Genesee River Basin(1)	Economic Base Area Task Group #1	Recreation Market Area Task Group #8	Fish & Wildlife Influence Area Task Group #9	Ontario Lake Plain Service Area(1) Task Group #5
New York State					
Allegany	x	x	x	x	
Cattaraugus	x	x	x	x	
Chautauqua			x		
Erie			x	x	
Genesee	x	x	x	x	
Livingston	x	x	x	x	x
Monroe	x	x	x	x	x
Niagara			x	x	x
Ontario	x	x	x	x	x
Orleans	x	x	x	x	
Steuben	x	x	x	x	
Wayne		x	x	x	
Wyoming	x	x	x	x	
Yates			x		
Subtotal	9	10	14	12	4
Commonwealth of Pennsylvania					
McKean			x		
Potter	x	x	x	x	
Tioga			x		
Warren			x		
Subtotal	1	1	4	1	0
TOTAL	10	11	18	13	4

(1) All or a portion of the county is included. Area is determined by drainage.

29. PUBLIC INFORMATION

The Coordinating Committee established a Task Group for public information. The prime purpose was to promote public awareness of the reason for and the objectives of the study, through whatever media were adopted as being consistent with the best interests of the study. The Task Group, #13, was chaired by New York State Water Resources Council and it published a brochure in September 1965 entitled, "Water's Ways to Progress."

30. A Public Information meeting was held by the Coordinating Committee in the Mount Morris Central School auditorium, Mount Morris, New York on the evening of 21 June 1966. The purpose of the meeting was to present to the people of the basin the study progress, show the ultimate goals and objectives of the study and provide an opportunity for members of the audience to ask questions. Most of the meeting's question and answer period centered on the fourteen major reservoir sites studied by the Corps of Engineers.

31. Personnel of the Department of Agriculture, Soil Conservation Service met with a number of local interested groups, various Soil and Water Conservation District Boards and county boards of supervisors at various times during the study to inform them of the objectives, progress and agricultural needs of the basin.

32. Formal meetings were held on 26, 27 and 28 September 1967 by the Department of Agriculture Soil Conservation Service together with representatives of the Forest Service, Economic Research Service and the Corps of Engineers. These meetings were with the Soil and Water Conservation District Directors and other local leaders of the affected counties for the purpose of reviewing planning progress and proposed basin plan. The meetings were held at Canandaigua, Rochester, Warsaw, Batavia, Mount Morris and Belmont, New York.

33. PUBLIC HEARINGS

Four public hearings were held in conjunction with the study. Two hearings were held early in the study to obtain the opinions of residents of the basin on the needs for development of water and related land resources and to obtain suggestions on how to meet these needs. These two hearings were held on 18 and 19 June 1963 in Rochester and Wellsville, New York, respectively. The hearings were sponsored jointly by the Genesee River Basin Coordinating Committee and the State of New York Water Resources Commission.

34. The other two public hearings were held in Mount Morris and Rochester, New York on 25 and 26 October 1967, respectively. The

hearings were sponsored by Coordinating Committee with Colonel A. L. Wright, Corps of Engineers and Mr. F. W. Montanari, Assistant Commissioner, Conservation Department, State of New York, acting as co-chairmen. The hearings were held to consider the proposed basin plan resulting the study. The portion of the basin plan developed by the Soil Conservation Service, which consists of 35 upland reservoir sites was favorably received by most people present. The multiple-purpose Portage Reservoir proposal drew heavy opposition and the large attendance at these hearings was directly attributable to the opposition. The multiple-purpose Canaseraga Valley project for local flood control and waterfowl habitat improvement received support but also met some opposition.

35. Further details concerning the public hearings can be obtained in Volume II, Appendix "A," History.

PHYSICAL DESCRIPTION OF THE BASIN

36. LOCATION AND EXTENT

The Genesee River Basin is in the eastern portion of the Great Lakes Region of the United States. It is located in western New York and northwestern Pennsylvania as shown in figure 5. The basin is roughly elliptical in shape, with a north-south major axis of approximately 100 miles and a maximum width of about 40 miles. The basin is bordered on the north by Lake Ontario, on the west by the Lake Erie-Niagara River Basins, on the east by the Oswego River Basin and on the south by the Allegheny and Susquehanna River Basins. The basin includes parts of Allegany, Cattaraugus, Genesee, Livingston, Monroe, Ontario, Orleans, Steuben and Wyoming Counties in New York and Potter County, Pennsylvania.

37. The Genesee River rises in the physiographic area known as the Allegheny Plateau, a few miles south of the New York-Pennsylvania border as shown in photograph 1. It then flows in a general northwesterly direction for about fifty miles and then in a northeasterly direction, passing through the city of Rochester, photograph 2 and empties into Lake Ontario, photograph 3. The river has a length of approximately 157 miles. The basin drains an area of 2,479 square miles, of which 2,383 square miles are in New York and 96 square miles are in Pennsylvania.

38. TOPOGRAPHY

The Genesee River Basin, topographically, consists of a series of terraces descending northward from the Allegheny Plateau to Lake Ontario, and separated by northward facing escarpments. This can be observed graphically in figure 6.

39. The Allegheny Plateau has its northern edge at the Portage Escarpment, which crosses the broadest part of the basin on an east-west line north of Mount Morris. Its face is deeply indented by the valleys of north-flowing streams. The seventeen mile gorge in Letchworth State Park is an excellent example of this feature as shown in photograph 4. This headwater plateau area consists of broad valleys at elevations of 1,000 to 2,000 feet above sea level, rising to the south and separated by rounded ridges rising up to 500 feet above the valley floor. Figure 7 shows the principal physical features of the basin.

40. North of the Portage Escarpment, the main river flows across two plain areas, known as the Erie and Huron Plains, which descend to the

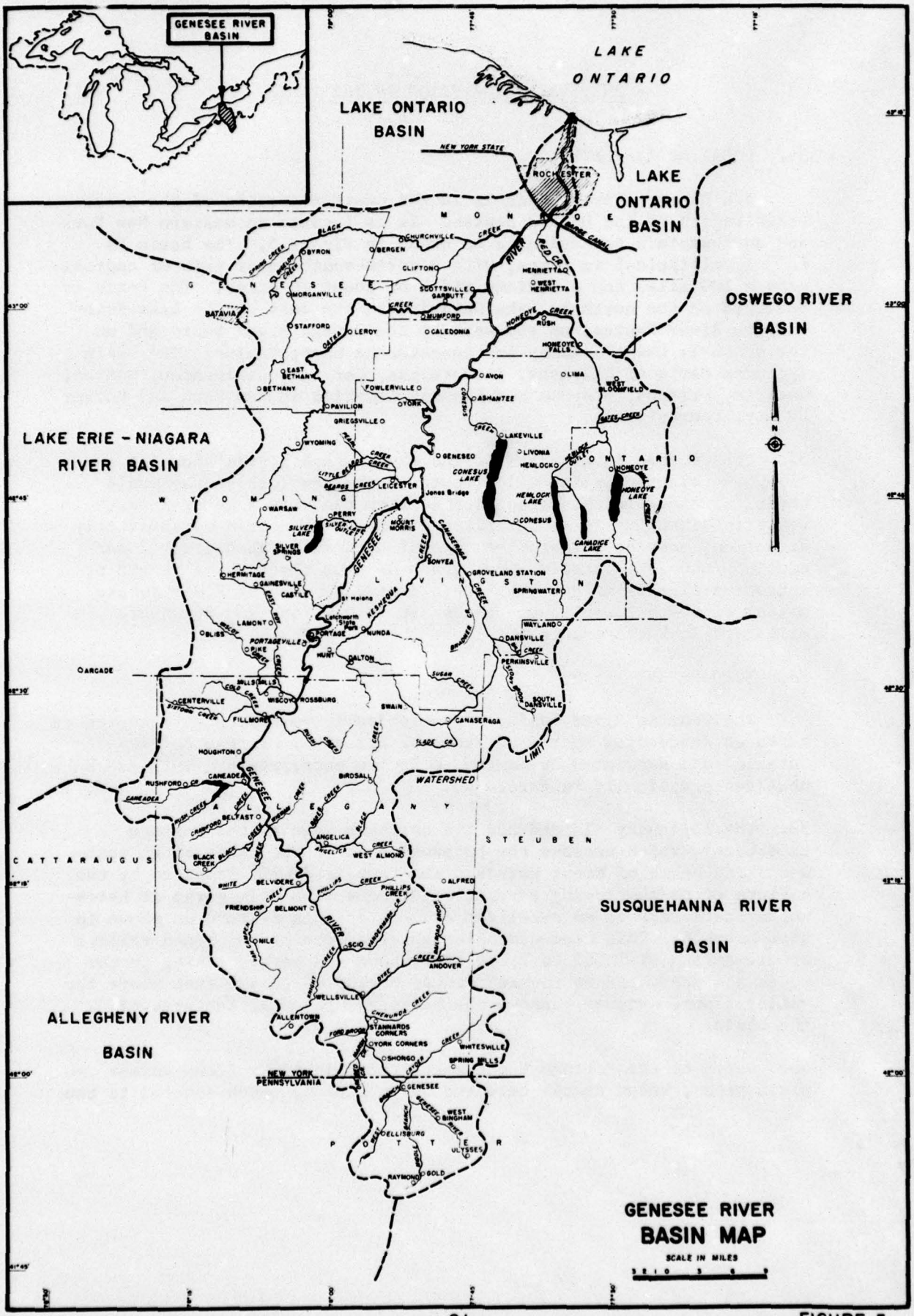

GENESEE RIVER BASIN
LAKE ONTARIO
LAKE ONTARIO BASIN
NEW YORK STATE
ROCHESTER
LAKE ONTARIO BASIN
OSWEGO RIVER BASIN
LAKE ERIE - NIAGARA RIVER BASIN
ALLEGHENY RIVER BASIN
SUSQUEHANNA RIVER BASIN
GENESEE
MONROE
LIVINGSTON
WYOMING
CATTARAUGUS
ALLEGANY
STEUBEN
ONTARIO
POTTER
NEW YORK PENNSYLVANIA
WATERSHED LIMIT
BATAVIA
LEROY
CALEDONIA
AVON
LIMA
GENESEO
CONESUS LAKE
HEMLOCK LAKE
CANADICE LAKE
HONEOYE LAKE
MOUNT MORRIS
LETCHWORTH STATE PARK
PORTAGE
GENESEE
CANASERAGA
ANGELICA
ALFRED
ANDOVER
WELLSVILLE
ALLENTOWN
SHONGO
GENESEE
ELLISBURG
ULYSSES
GENESEE RIVER
BASIN MAP
SCALE IN MILES

FIGURE 5

Photo No. 1 - Headwaters of the Middle Branch, Genesee River near Gold, Pennsylvania. View look SSW toward Gold. Genesee River can be observed in foreground with surrounding hills rising to approximately elevation 2500.

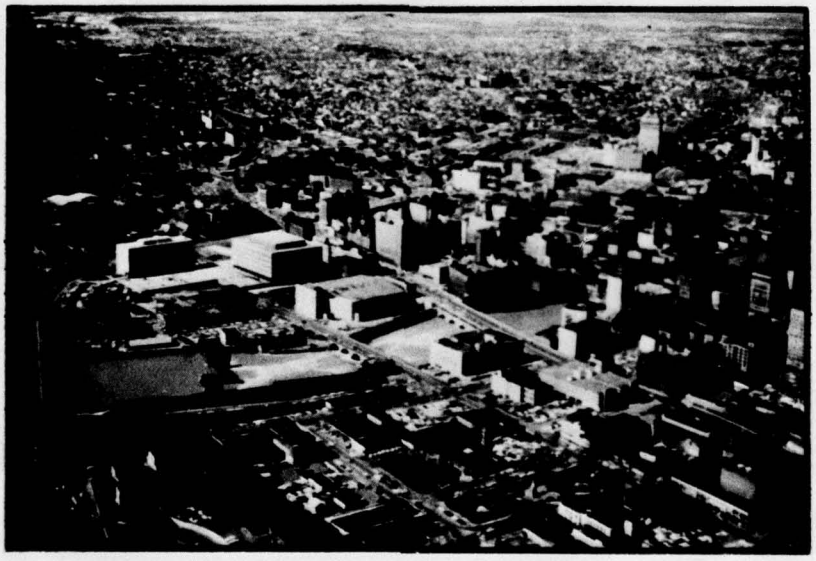


Photo No. 2 - Genesee River flowing through Rochester, New York. Court Street Dam which controls the river levels at the Barge Canal crossing can be observed in the left foreground.

Photo No. 3 - Genesee River as it empties into Lake Ontario. The river is navigable to ocean and lake vessels in this reach. The river is dredged to 21 feet in the foreground and 23 feet nearer the Lake Ontario.

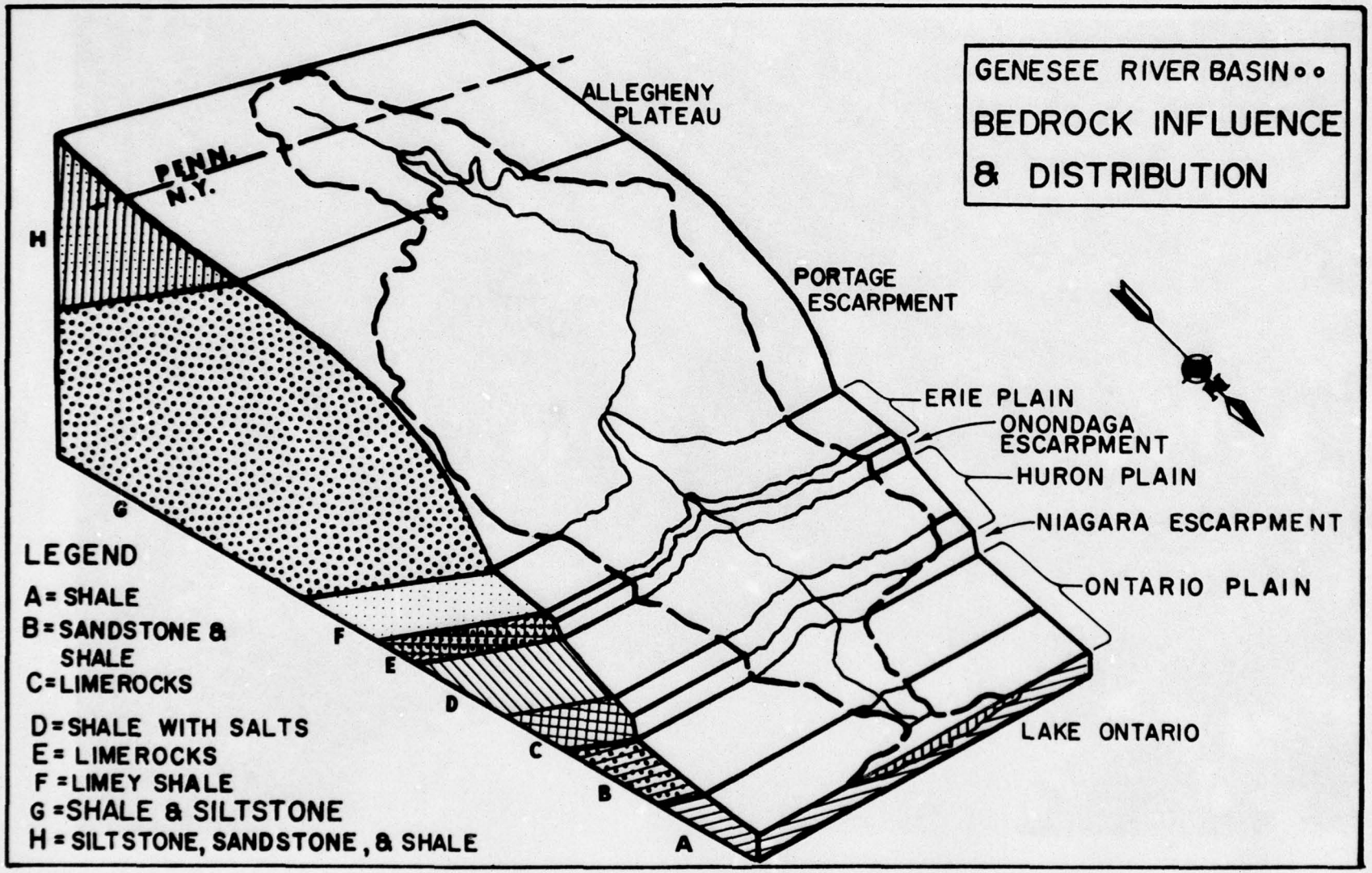

GENESEE RIVER BASIN
BEDROCK INFLUENCE
& DISTRIBUTION
ALLEGHENY PLATEAU
PENN.
N.Y.
PORTAGE ESCARPMENT
ERIE PLAIN
ONONDAGA ESCARPMENT
HURON PLAIN
NIAGARA ESCARPMENT
ONTARIO PLAIN
LAKE ONTARIO
LEGEND
A = SHALE
B = SANDSTONE & SHALE
C = LIMEROCKS
D = SHALE WITH SALTS
E = LIMEROCKS
F = LIMEY SHALE
G = SHALE & SILTSTONE
H = SILTSTONE, SANDSTONE, & SHALE
H
G
F
E
D
C
B
A

FIGURE 6

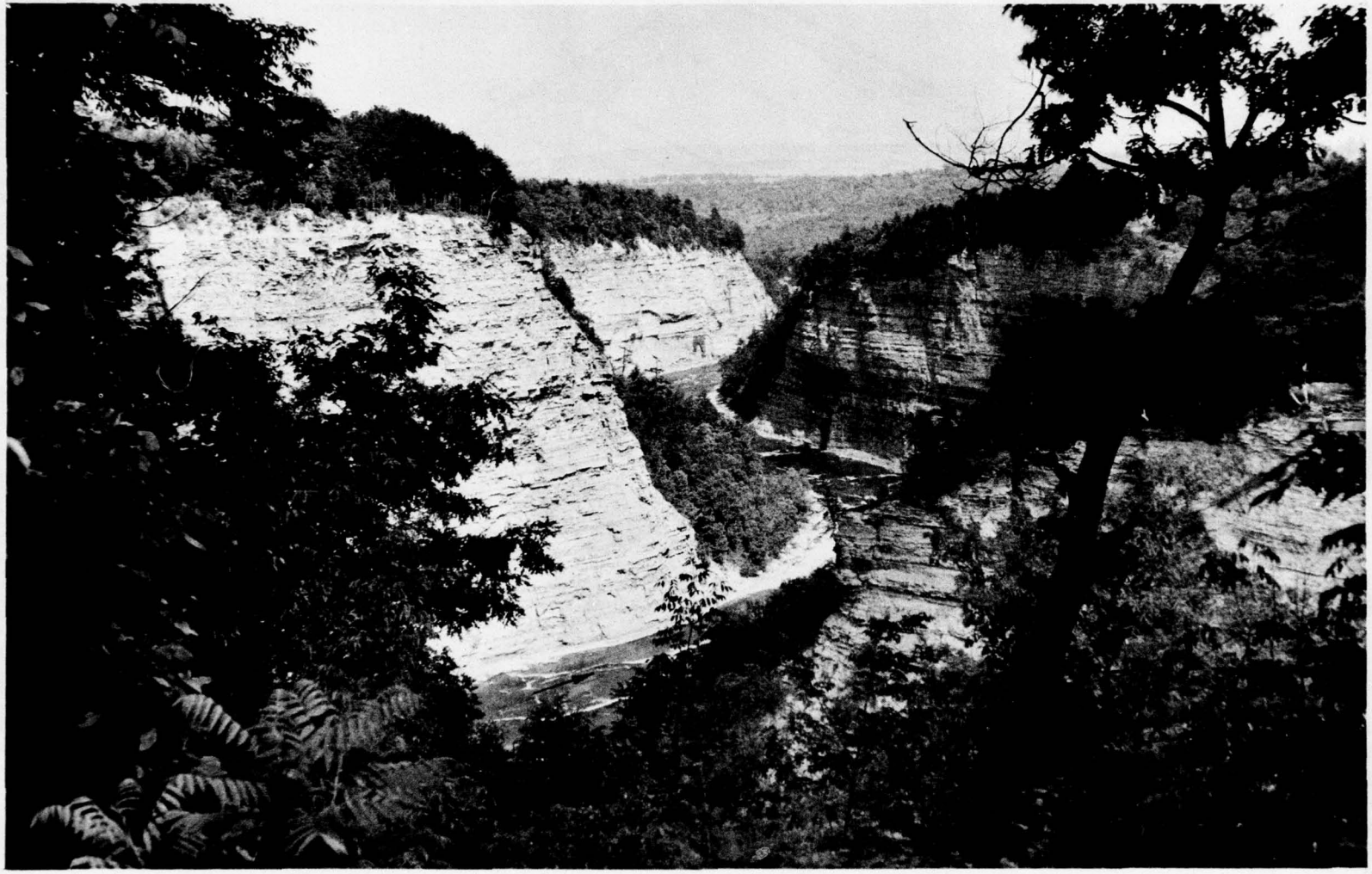
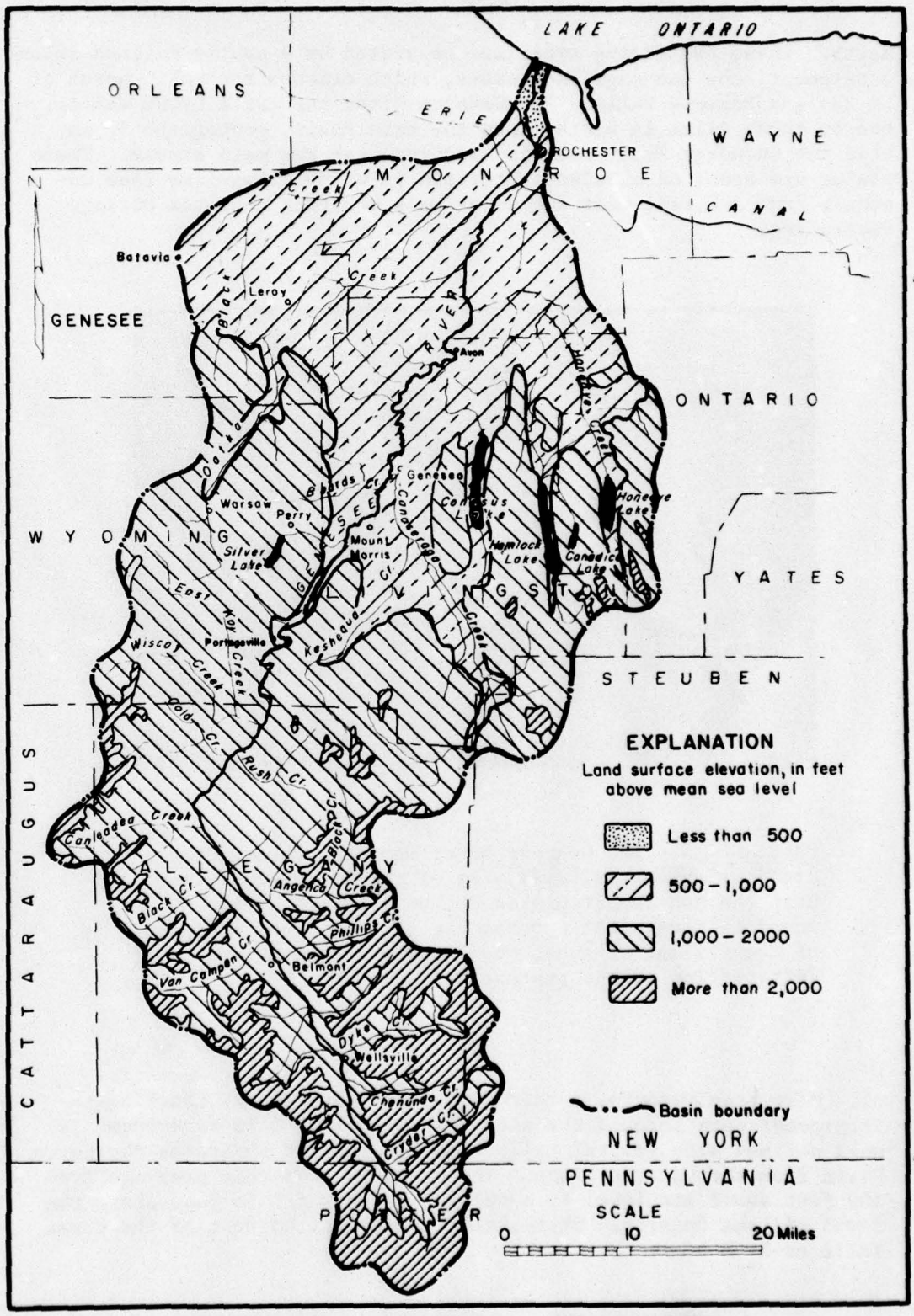


Photo No. 4 - "Portage Gorge" in Letchworth State Park. The Genesee River has cut a seventeen mile long gorge into the "Portage Escarpment" as it flows from the Allegheny Plateau into the Erie-Huron Plains. (Photo courtesy of Genesee State Park Commission)



PRINCIPAL PHYSICAL FEATURES

FIGURE 7

north. These two plains areas are separated by a poorly defined second escarpment, the Onondaga Escarpment, which crosses the basin north of Le Roy and Honeoye Falls. The Genesee River has cut a broad valley, one to three miles in width, into the Erie Plain, photograph 5, so that the Onondaga Escarpment is obscured near the main stream. These plains are areas of undulating terrain in which elevations rise unevenly from 500 feet near Rochester to 1,000 feet near the Portage Escarpment.

Photo No. 5 - The Genesee River meanders through the broad, rich agricultural area of the Erie-Huron Plains near the Monroe-Livingston county boundary. The Onondaga Escarpment crosses the valley in the vicinity of the village of Avon, New York, which is in the upper left portion of the photograph.

41. Near Lake Ontario, a third and final escarpment, the Niagara Escarpment cuts through the city of Rochester. This escarpment is well defined with several falls at Rochester and separates the Huron Plain from the Ontario Plain. The elevations of this area are from 500 feet above sea level to about 250 feet, which is just above the level of Lake Ontario. Photograph 6 shows the highest of the three falls at Rochester.

Photo No. 6 - The Genesee River flows over the Niagara Escarpment in a series of three falls within the City of Rochester. The view is of the "Lower" falls with the Rochester Gas and Electric Company's hydroelectric plant 5 at the left.

42. GEOLOGY

The geologic structure of the Genesee River basin is simply stated: The base or "foundation" is bedrock mainly of Devonian and Silurian age, some thousands of feet in thickness and which is composed of layers of shale, limestone, dolomite and sandstone. These formations are shown in board groups on figure 6 and groups A through D are mainly of Silurian age with E through H of Devonian age. These layers dip gently to the south at an average of between 40 to 60 feet per mile. Successions of layers are classified geologically as a "group" of formations, a "formation," or a "member" of a formation. On top of the bedrock are glacial (Pleistocene) deposits of clay, sand, and gravel. These deposits are thin on the uplands, generally less than 50 feet in thickness, and at some places less than 10 feet. On the other hand, in the valleys of the Genesee River and its principal tributaries, the glacial deposits are commonly between 100 and 300 feet in thickness; maximum recorded thickness is about 600 feet. The principal exceptions to such thicknesses in the valleys are the Genesee River gorges between Portageville and Mount Morris and at Rochester where bedrock is at or close to the land surface.

43. Each layer of bedrock was deposited as clay, lime, or sand on the bottom of the sea which covered the entire Genesee region several hundred million years ago. With deep burial these sediments were compacted and cemented into shale, limestone, and sandstone. About 200 to 300 million years ago, the region rose above the sea. Since that time the uplifted land has been almost constantly subjected to erosion except for periods of resubmergence.

44. Just prior to glaciation, some of the major topographic features of the Genesee River basin resembled their present forms, but with several important differences. The hilltops were steeper and rockier, and bare rock was probably visible in many more places than it is now. It has been suggested that the Genesee River system was much larger than it is today, and included a major east branch which flowed in what is now the wide valley of Canaseraga Creek.

45. The landscape was again subjected to major changes during Pleistocene times. Most of the unconsolidated deposits were formed when a continental glacier spread southward from Canada as a result of climatic conditions that caused ice and snow to accumulate each year at a faster rate than they were melting. The massive ice sheet, hundreds of feet in thickness, ground its way into and over most of New York State. Hilltops were rounded, some valleys were widened or deepened, and the glacier by its crushing and abrasive action on the land surface, produced tremendous quantities of rock debris, much of it the dense clay-sand-gravel mixture known as "till." Finally the climate became warmer, melting began to predominate over freezing, and the glacier began its slow retreat northward, interrupted occasionally by substantial periods of time when the ice front was relatively stationary.

46. When the glacier first began its southward advance, the outlets of north-flowing streams such as the Genesee were blocked, and temporary lakes formed in front of the glacier while the streams were forced to find new outlets to the east, west, and south. Erosion was the predominant geologic process. Then, as the glacier retreated, several kinds of clay, sand, and gravel deposits were formed. These include a mantle of till on most of the uplands, outwash deposits of sand and gravel in glacier-fed streams, extensive clay deposits in glacier-blocked lakes, and layers of till, clay, sand, and gravel in various proportions in places where the glacier halted for a long period of time (moraine deposits). Many of the deeper valleys were filled with rock debris from the melting glacier, sometimes as till and at other times as sorted deposits of clay or sand and gravel. This valley filling was so extensive in some cases that a former stream course was blocked entirely. Thus, much of the former "East Branch" of the Genesee River was permanently blocked off, and the main river carved a new course northward at Portageville and Avon resulting in the present gorges of the Genesee River through Letchworth Park and at Rochester.

47. One of the most extensive types of deposits resulting from glacial action in the Genesee River basin is fine-grained sediment, mostly clay and silt, which is thick and extensive, especially in the central part of the basin. These sediments were deposited in a series of glacial lakes that extended completely across the present valley of the Genesee

River. As the glacier retreated northward, successively lower melt-water outlets across the divides of the valley were uncovered and lakes were formed at successively lower altitudes. After the lakes were drained, many of the lake deposits were removed by erosion, especially in the central parts of the valleys.

48. The most permeable deposits of glacial origin are sand and gravel. As the ice sheet receded, the melt-water streams which issued from the glacier deposited large quantities of sand and gravel, especially at the foot of the glacier in the glacier-blocked lakes and in fans and floodplains on top of the drained lake deposits of finer grained materials. Some upland streams deposited sand and gravel at the edges of glacial lakes. These deposits interfinger with finer grained, lake-laid deposits of silt and clay.

49. The preceding discussion of glacial history, even though brief and greatly simplified, indicates the great extent and sometimes complex nature of the glacial deposits and geology in the Genesee River basin.

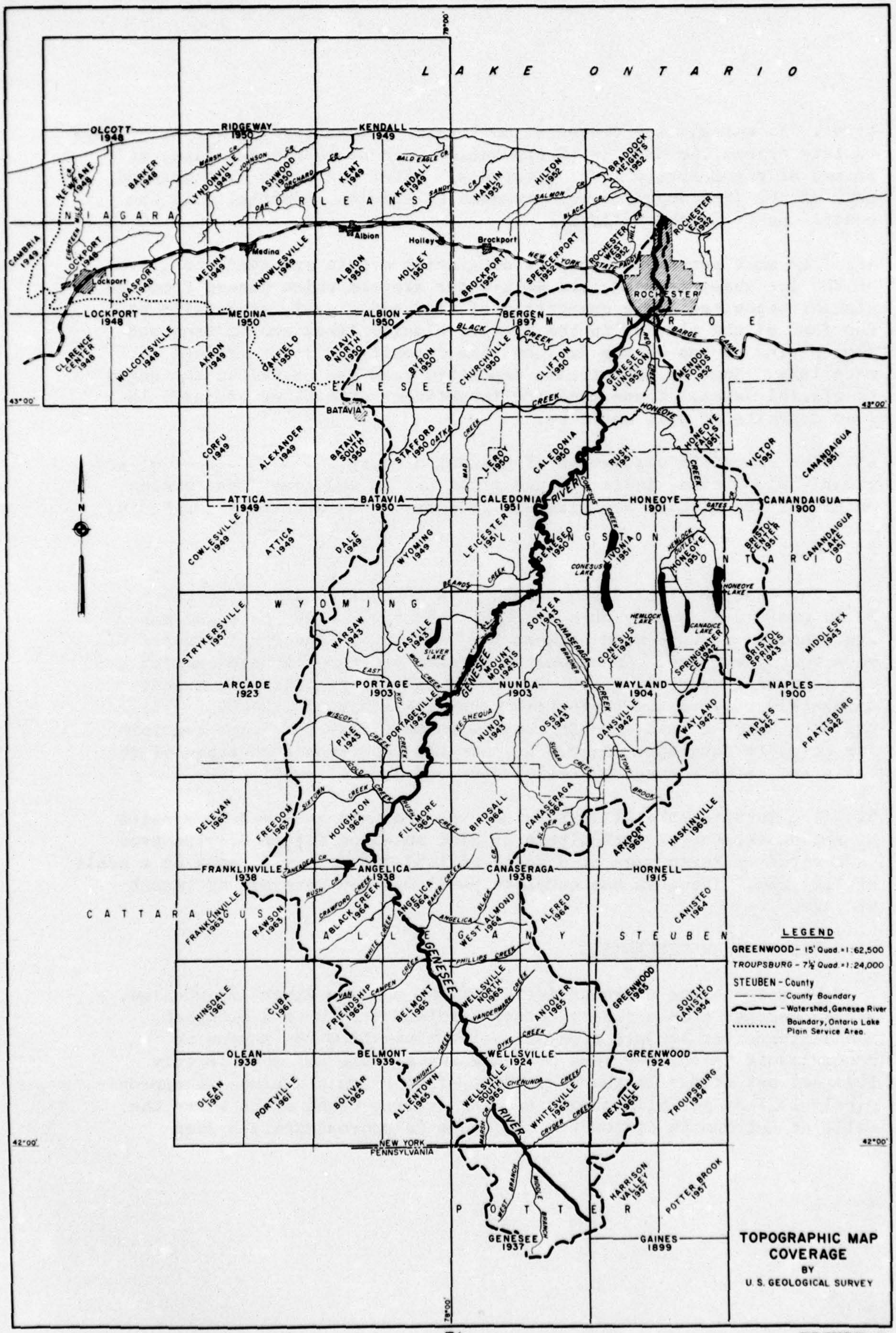
50. MAPS

The Genesee River Basin is shown on 20 maps published by the U. S. Geological Survey on a scale of 1:62,500. Eight of these maps are based on surveys made between 1897 and 1904. The remaining are of more recent vintage. An extensive mapping program has been carried out in recent years by the U. S. Geological Survey which has almost completely covered the basin with maps of a scale of 1:24,000. There are 63 published maps of this scale with only five more maps remaining for complete coverage. Figure 8 shows the topographic coverage of the basin and service area, by scale, name and date of publishing.

51. The Ontario Lake Plain Service Area that was included in studies by the Department of Agriculture is also shown on figure 8. The area is covered by seven maps at a scale of 1:62,500 and by 22 maps at a scale of 1:24,000. The area has complete published map coverage of recent vintage.

52. STREAM CHARACTERISTICS

When the slope characteristics of the Genesee River are studied, a great contrast from a flashy, steep gradient stream to a sluggish, meandering river becomes apparent. The river from its source in Pennsylvania to the New York boundary has a slope of approximately 102 feet per mile. In the next twenty-five miles the slope is approximately 12 feet per mile and in the last thirty-eight miles above the falls at Letchworth State Park the slope is approximately 6 feet



TOPOGRAPHIC MAP COVERAGE BY U.S. GEOLOGICAL SURVEY

FIGURE 8

per mile. In the seventeen miles of Letchworth State Park, just upstream of Mount Morris Dam, the river drops about 317 feet, over three successive falls as it flows through a deep, rock gorge. Photograph 7 shows the highest of these falls. It then flows from the deep gorge at the village of Mount Morris into the flat alluvial plains, up to three miles wide that extends approximately fifty-three miles to Rochester. The slope of the river in this reach is approximately 0.8 foot per mile, at Rochester, the river drops over three falls for a drop of 255 feet in about two and one half miles. The remaining six miles to Lake Ontario is mainly governed by the level of the lake.

Photo No. 7 - Middle Falls, 107 feet, the highest of the three falls of the Genesee River in Letchworth State Park. (Photo courtesy of Genesee State Park Commission.)

53. The profile of the Genesee River and its principal tributaries are shown on figure 9. Table 4 shows the slope data for the main stem and some tributaries.

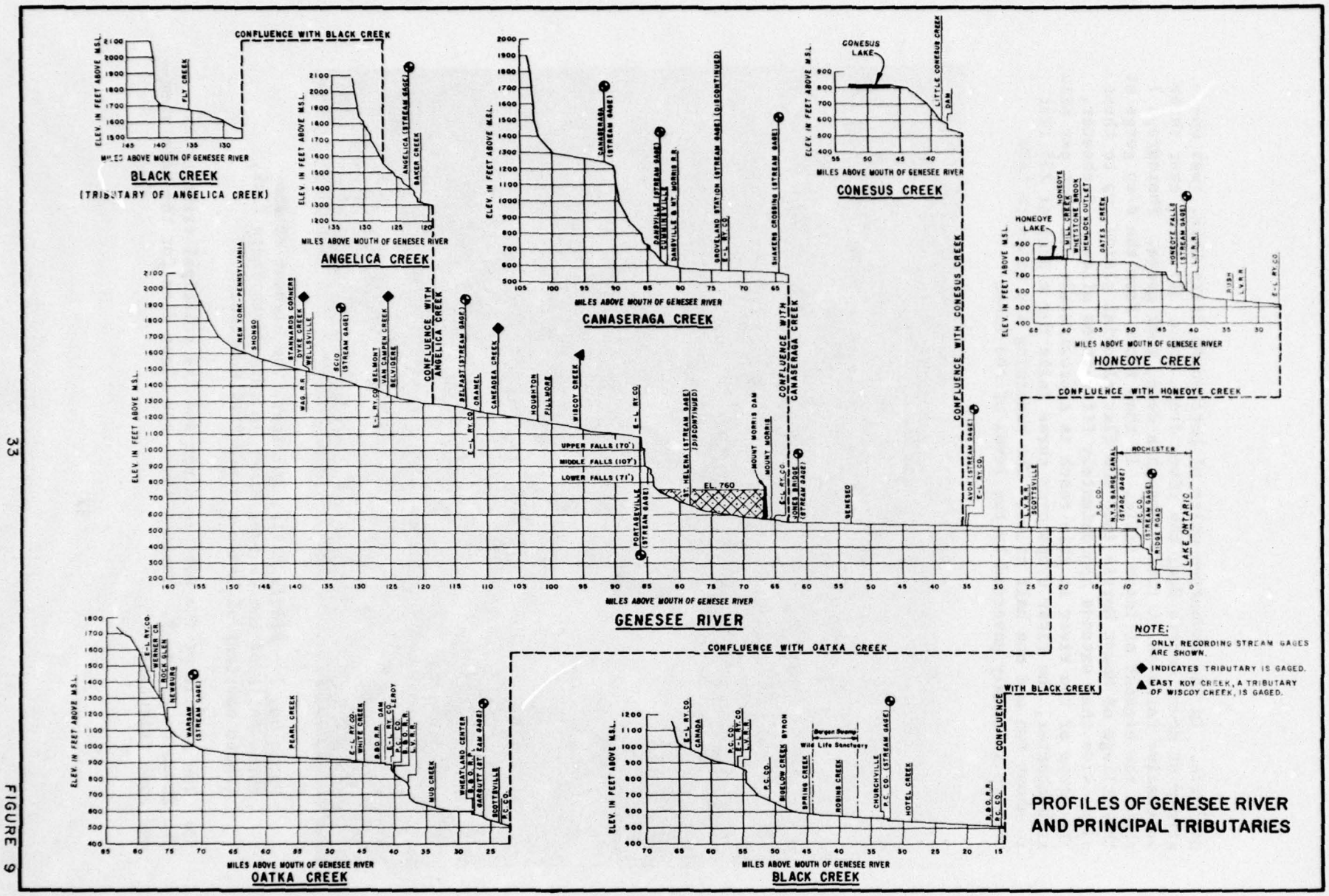

BLACK CREEK
(TRIBUTARY OF ANGELICA CREEK)
ELEV. IN FEET ABOVE MSL.
MILES ABOVE MOUTH OF GENESEE RIVER
FLY CREEK
CONFLUENCE WITH BLACK CREEK
ANGELICA CREEK
ANGELICA (STREAM GAGE)
BAKER CREEK
CANASERAGA CREEK
CANASERAGA (STREAM GAGE)
DANSVILLE (STREAM GAGE)
DANSVILLE & MT. MORRIS R.R.
GROVELAND STATION (STREAM GAGE) (DISCONTINUED)
SHAKERS CROSSING (STREAM GAGE)
CONFLUENCE WITH CANASERAGA CREEK
CONESUS LAKE
LITTLE CONESUS CREEK DAM
CONESUS CREEK
CONFLUENCE WITH CONESUS CREEK
HONEOYE LAKE
HONEOYE
MILL CREEK
WHETSTONE BROOK
HEMLOCK OUTLET
GATES CREEK
HONEOYE FALLS (STREAM GAGE)
L.V.R.R.
RUSH
E-L. RY. CO.
HONEOYE CREEK
CONFLUENCE WITH HONEOYE CREEK
GENESEE RIVER
NEW YORK - PENNSYLVANIA
SHONGO
STANNARDS CORNERS
OLEAN CREEK
WELLSVILLE
W.A.G. R.R.
BCIO (STREAM GAGE)
E-L. RY. CO.
BELMONT
VAN CAMPENS CREEK
BELVIDERE
CONFLUENCE WITH ANGELICA CREEK
BELFAST (STREAM GAGE)
ORANGEL
CANEADEA CREEK
E-L. RY. CO.
HOUGHTON
FILLMORE
WISCOY CREEK
E-L. RY. CO.
UPPER FALLS (70')
MIDDLE FALLS (107')
LOWER FALLS (71')
PORTAGEVILLE (STREAM GAGE)
ST. HELENA (STREAM GAGE) (DISCONTINUED)
EL 760
MOUNT MORRIS DAM
MOUNT MORRIS
E-L. RY. CO.
JONES BRIDGE (STREAM GAGE)
GENESEO
AVON (STREAM GAGE)
E-L. RY. CO.
L.V.R.R.
SCOTTSVILLE
P.C. CO.
N.Y.S. BARGE CANAL (STAGE GAGE)
ROCHESTER
P.C. CO. (STREAM GAGE)
RIDGE ROAD
LAKE ONTARIO
MILES ABOVE MOUTH OF GENESEE RIVER
OATKA CREEK
E-L. RY. CO.
WERNER CR.
ROCK GLEN
NEWBURG
WARSAW (STREAM GAGE)
PEARL CREEK
E-L. RY. CO.
WHITE CREEK
B.R.O.R.R. DAM
E-L. RY. CO.
P.C. CO.
B.R.O.R.R.
L.V.R.R.
MUD CREEK
WHEATLAND CENTER
B.R.O.R.R.
GARBUTT (ET RAM GAGE)
SCOTTSVILLE
P.C. CO.
CONFLUENCE WITH OATKA CREEK
BLACK CREEK
E-L. RY. CO.
CANADA
P.C. CO.
E-L. RY. CO.
L.V.R.R.
P.C. CO.
BIGELOW CREEK
BYRON
SPRING CREEK
Morgan Swamp
Wild Life Sanctuary
ROBINS CREEK
CHURCHVILLE
P.C. CO. (STREAM GAGE)
HOTEL CREEK
B.R.O.R.R.
P.C. CO.
CONFLUENCE WITH BLACK CREEK
NOTE:
ONLY RECORDING STREAM GAGES ARE SHOWN.
INDICATES TRIBUTARY IS GAGED.
EAST ROY CREEK, A TRIBUTARY OF WISCOY CREEK, IS GAGED.
PROFILES OF GENESEE RIVER AND PRINCIPAL TRIBUTARIES

FIGURE 9

TABLE 4 - Stream slope, Genesee River and major tributaries

Stream	Location	River mile from mouth	Drainage area above location sq./mi.	River-bed elevation feet	Average slope feet/mi.
Genesee	Lake Ontario	0	2,479	220(1)	-
"	Rochester gage-Lower Falls	6.1	2,467	249	4.7
"	Rochester-Court St. Dam	8.2	-	495(2)	Falls
"	Rochester-Barge Canal Crossing	11.6	2,452	501	1.8
"	Black Creek-confluence	14.1	-	501	0
"	Oatka Creek-confluence	21.7	-	504	0.4
"	Honeoye Creek-confluence	26.6	-	504	0
"	Jones Bridge	61.2	1,419	538	1.0(0.8)
"	Canaseraga Creek-confluence	62.0	-	541	3.7
"	Mount Morris-Power Dam	65.5	-	561(4)	5.7
"	Mount Morris-C. of E. Dam	66.9	1,077	576	Power Pool
"	Portageville gage	86.7	982	1,085	3 Falls
"	Belfast	113.5	642	1,244	5.9
"	Belmont	126.9	-	1,359	8.6
"	Scio gage	132.8	309	1,438	13.4
"	Wellsville (Dyke Creek)	137.7	288	1,479	8.4
"	N.Y.-Pa. Boundary	148.8	96	1,615	12.3
"	Source	156.5	0	2,400	101.9
TRIBUTARIES					
Black	Confluence to source	52	187	501-1250	14
Oatka	" " "	60	215	504-1730	20
Honeoye	Confluence to Honeoye Lake	34	263(5)	504-802	9
Canaseraga	Confluence with Genesee River	0	340	541	-
"	Groveland Station	9.8	181	568	2.8
"	Dansville gage	18.5	153	643	8.6
"	Source	42	0	1,900	53.5

(1) Low water datum for Lake Ontario 242.8 (IGLD 1955)
(2) Crest elevation 513.1 feet (Barge Canal pool)
(3) Average slope for Lower Genesee-Court St. Dam to Jones Bridge
(4) Crest elevation 580.0
(5) Includes drainage of Honeoye, Canadice and Hemlock Lakes

54. The Genesee River and some of its tributaries are major sediment transporters. In an average year the Genesee River carries 1.2 million tons of sediment past the Avon gaging station. This amounts to about 750 tons for each of the 1,666 square miles above the gage. The material so transported is eroded from both the surrounding land surface and the stream channels in the basin. Additional data concerning the sediment loading characteristics appears in volume VI, Appendix "K," Sedimentation, of this report.

55. LAKES

There are six major lakes in the basin and numerous ponds. The four lakes in the lower basin are natural and considered a part of the Finger Lake chain. They are Honeoye Lake, Canadice Lake, Hemlock Lake and Conesus Lake. In the upper basin, above Mount Morris Dam, there is one natural lake, Silver Lake and one artificial impoundment, Rushford Lake. Table 5 gives a brief description of the above lakes.

TABLE 5 - Description of lakes in Genesee Basin

Name	Surface area (sq. mi.)	Drainage area (sq. mi.)	Feeder streams	Outlet streams
Honeoye	2.61	35	Honeoye Inlet	Honeoye Creek
Canadice	0.97	12	-	Canadice Outlet
Hemlock	2.90	50	Springwater Cr., Reynolds Gully Cr.	Hemlock Outlet
Conesus	5.08	60	Wilkins Cr. N. McMillan Cr., Conesus Inlet, S. McMillan Cr.	Conesus Creek
Silver	1.19	16	Silver Lake Inlet	Silver Lake Outlet
Rushford	0.91	61	Canadea Creek, Rush Creek	Canadea Creek

56. CLIMATE

The climate of the Genesee is generally that of the humid or forest climate which prevails over most of the United States east of the Mississippi River. The basin has cold winters and mild summers. The average freeze-free period is 140 to 160 days for the Ontario Plain area and 110 to 150 days for the Allegheny Plateau. Additional data concerning hydrology are contained in Appendix "E," Hydrology and Appendix "J," Agricultural Studies.

57. TEMPERATURE

The temperature extremes for the basin are very marked, ranging from 104°F to minus 40°F. These extremes and means are shown for several localities on figure 10. Lake Ontario has a moderating influence on the temperatures of the Ontario Plain area. The average annual temperature of the lower basin is approximately 48°F and the Allegheny Plateau area is 46°F. The monthly average temperatures are shown for these two major areas of the basin on figure 11.

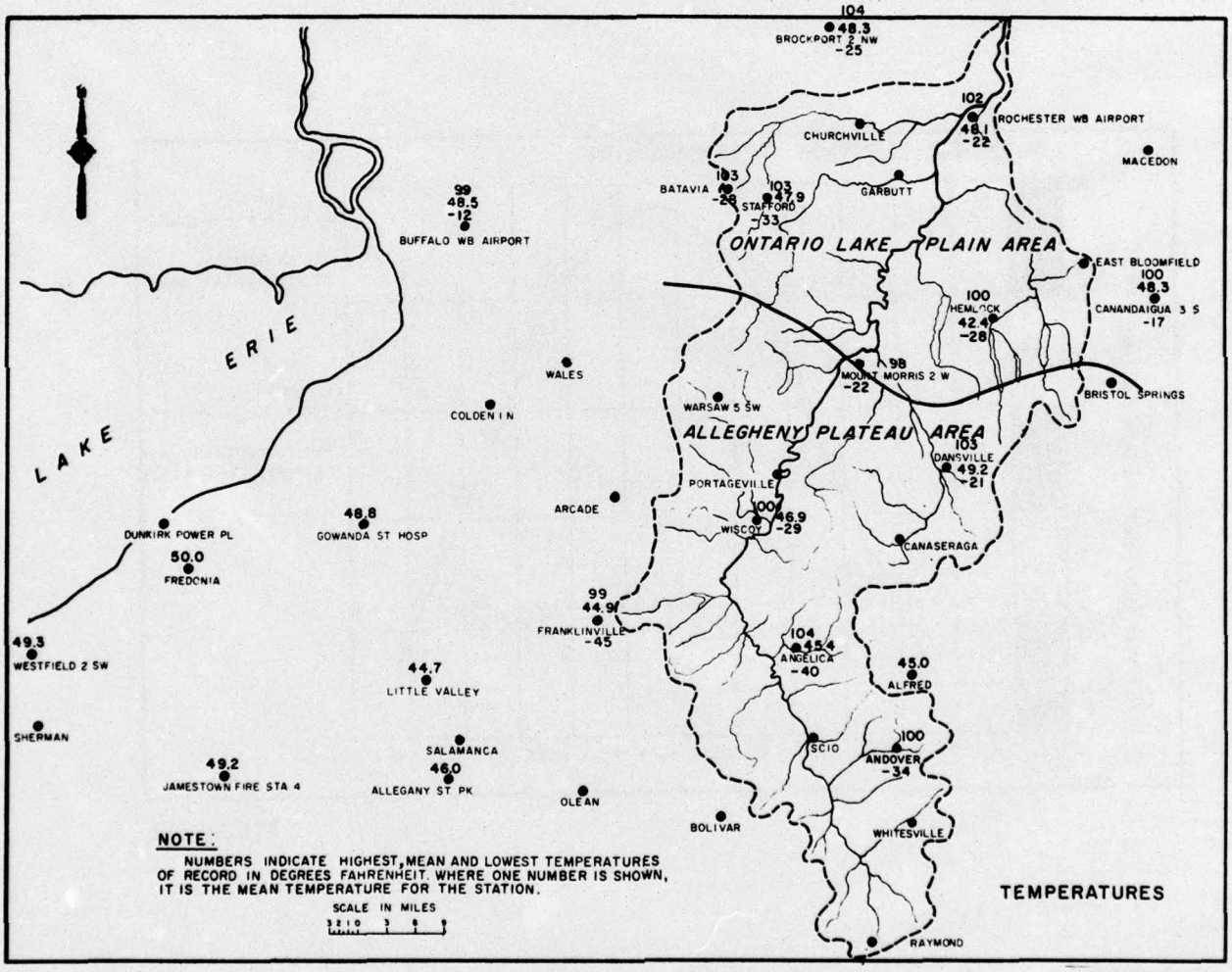


FIGURE 10

58. Average temperatures for the months of December, January and February remain below freezing. This fact becomes important as a contributor to water availability for runoff. Historical occurrences of warming spells, particularly during January have been the prime reason for a number of serious floods.

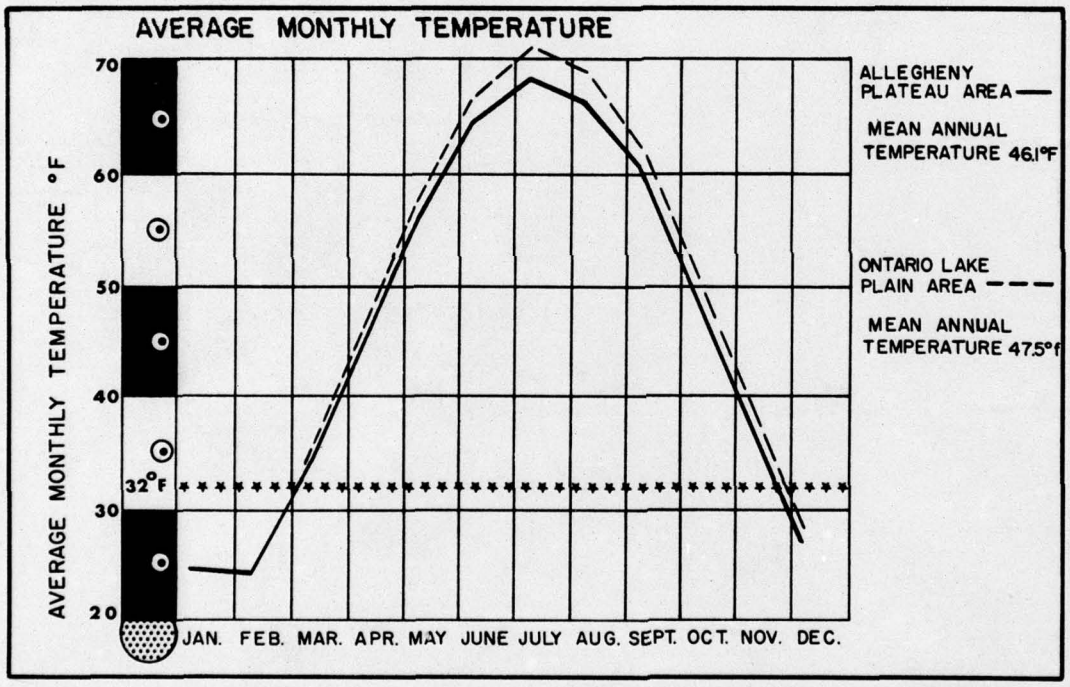


FIGURE 11

59. PRECIPITATION

The Genesee is a region with annual precipitation varying from approximately 25 to 40 inches, and with sharp differences between the western rim of the basin and the central area. The differences from one area of the valley to another can be readily observed in figure 12. Although amounts are not the same, the general pattern of distribution is similar in both the winter and summer periods. Figures 13 and 14 show this distribution.

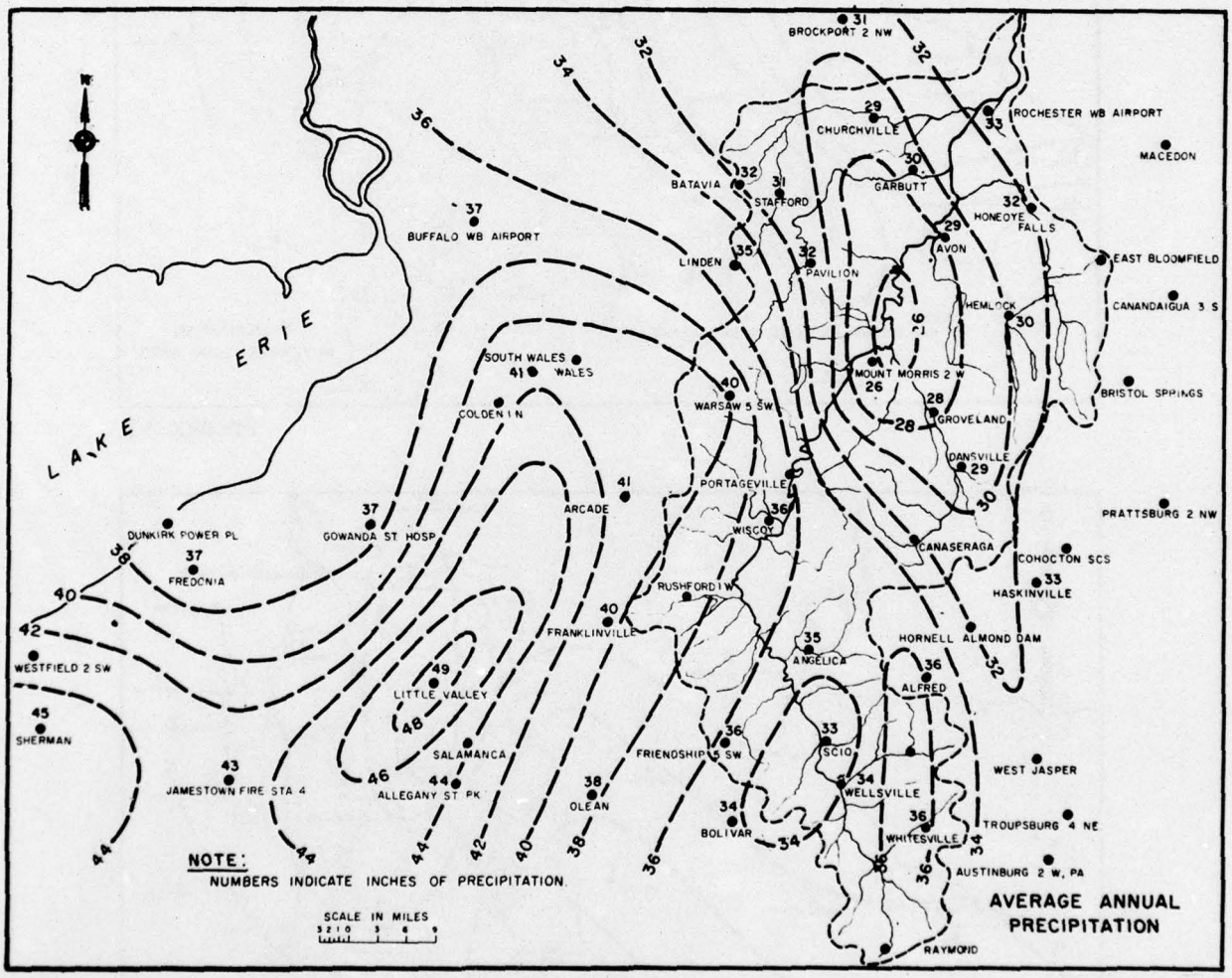


FIGURE 12

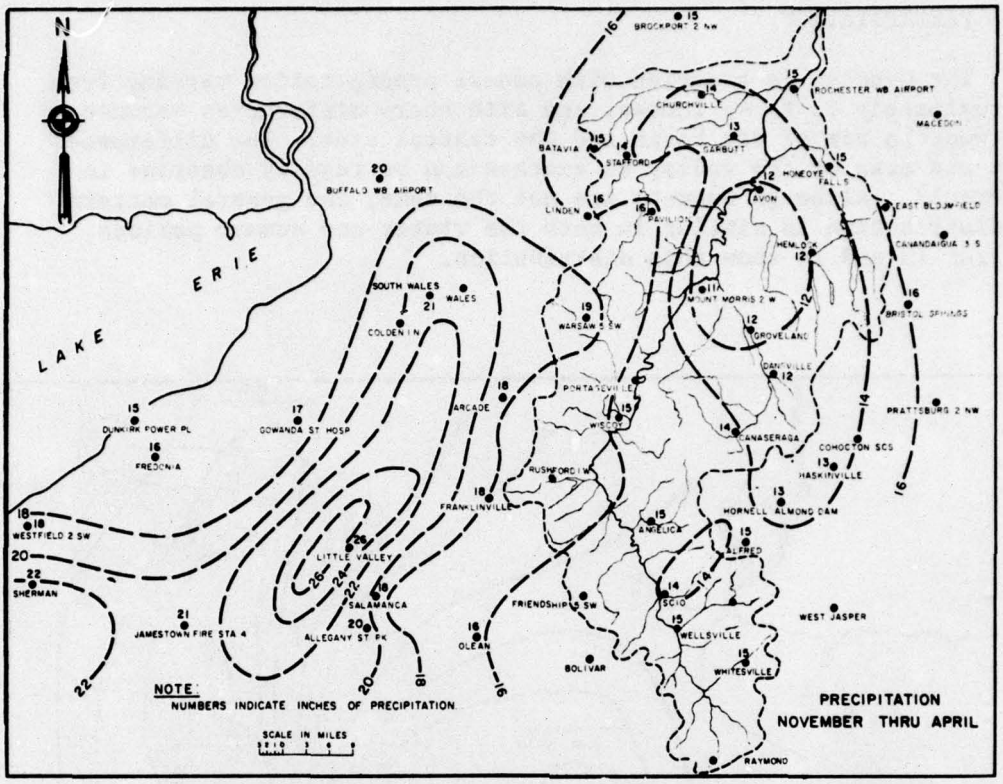


FIGURE 13

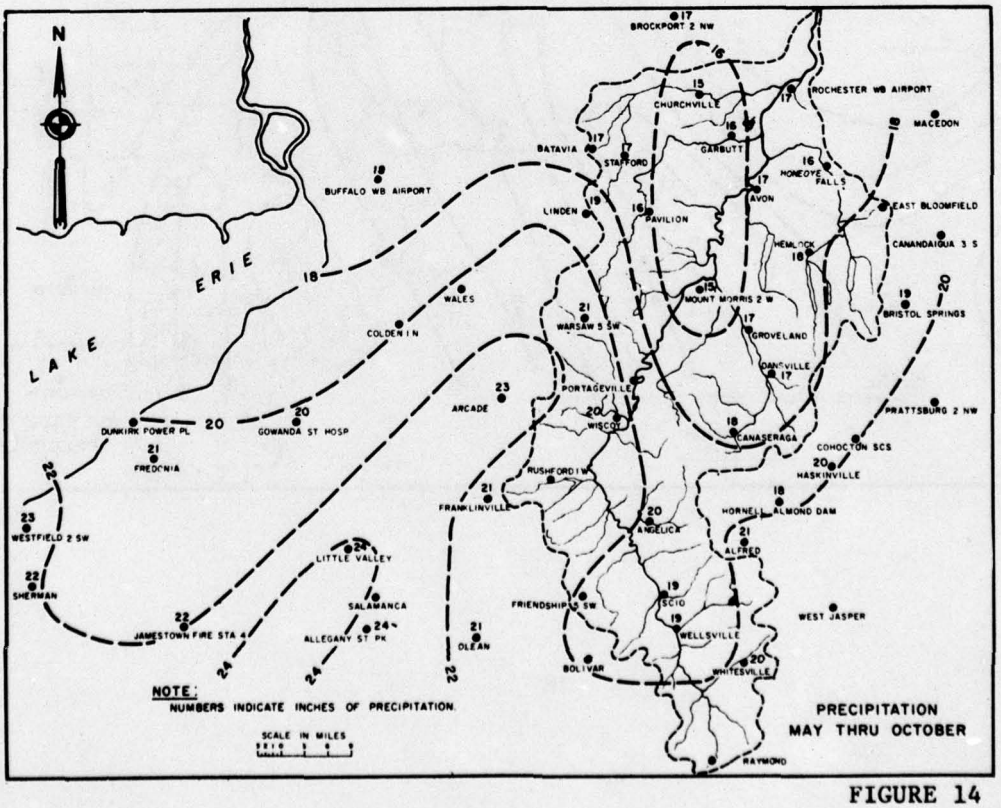


FIGURE 14

60. The average monthly distribution of rainfall is shown in figure 15 for the two major agricultural regions of the basin. The rainfall is fairly well distributed throughout the year with the months of May, June and July normally having the greatest total monthly amounts. In many years drought conditions are prevalent along the Ontario Lake Plains from the last week of July through September.

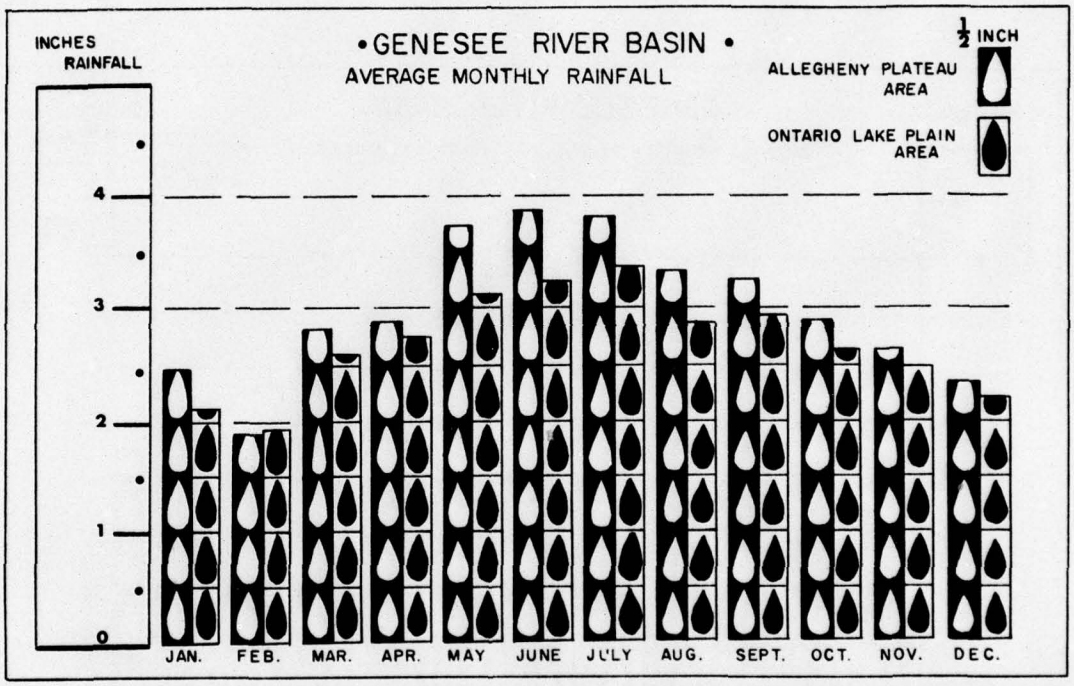


FIGURE 15

61. RUNOFF AND STREAMFLOW

Average annual runoff totals about 14 inches with a basin-wide range of 10 to 20 inches. Throughout the basin, average annual runoff is consistently about 20 inches less than precipitation. Runoff distribution over the year as denoted by figure 16 is subject to extreme fluctuations as contrasted to the fairly uniform rate of precipitation. It should be noted from this figure that runoff is in excess of rainfall for the months of March and April. A combination of frozen soils, rising temperatures, melting snow and rainfall produce periods of heavy runoff. Conversely, runoff in the summer months is extremely low compared to rainfall. This is due to the general frontal type of precipitation consisting of low intensity and long duration rains and soils conditions conducive to high infiltration.

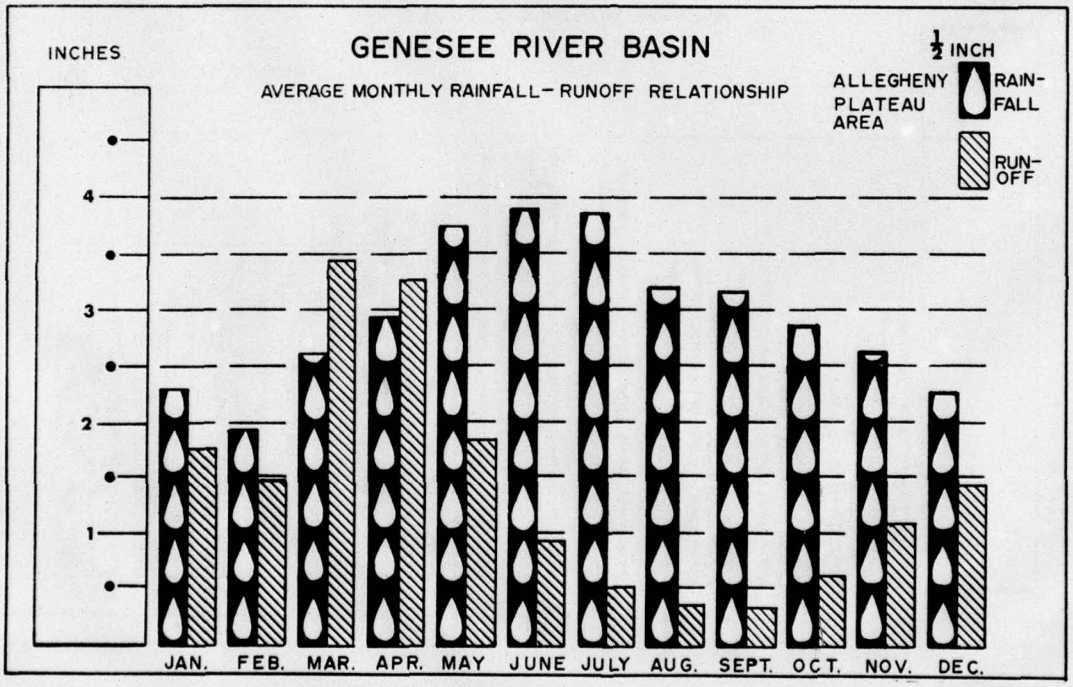
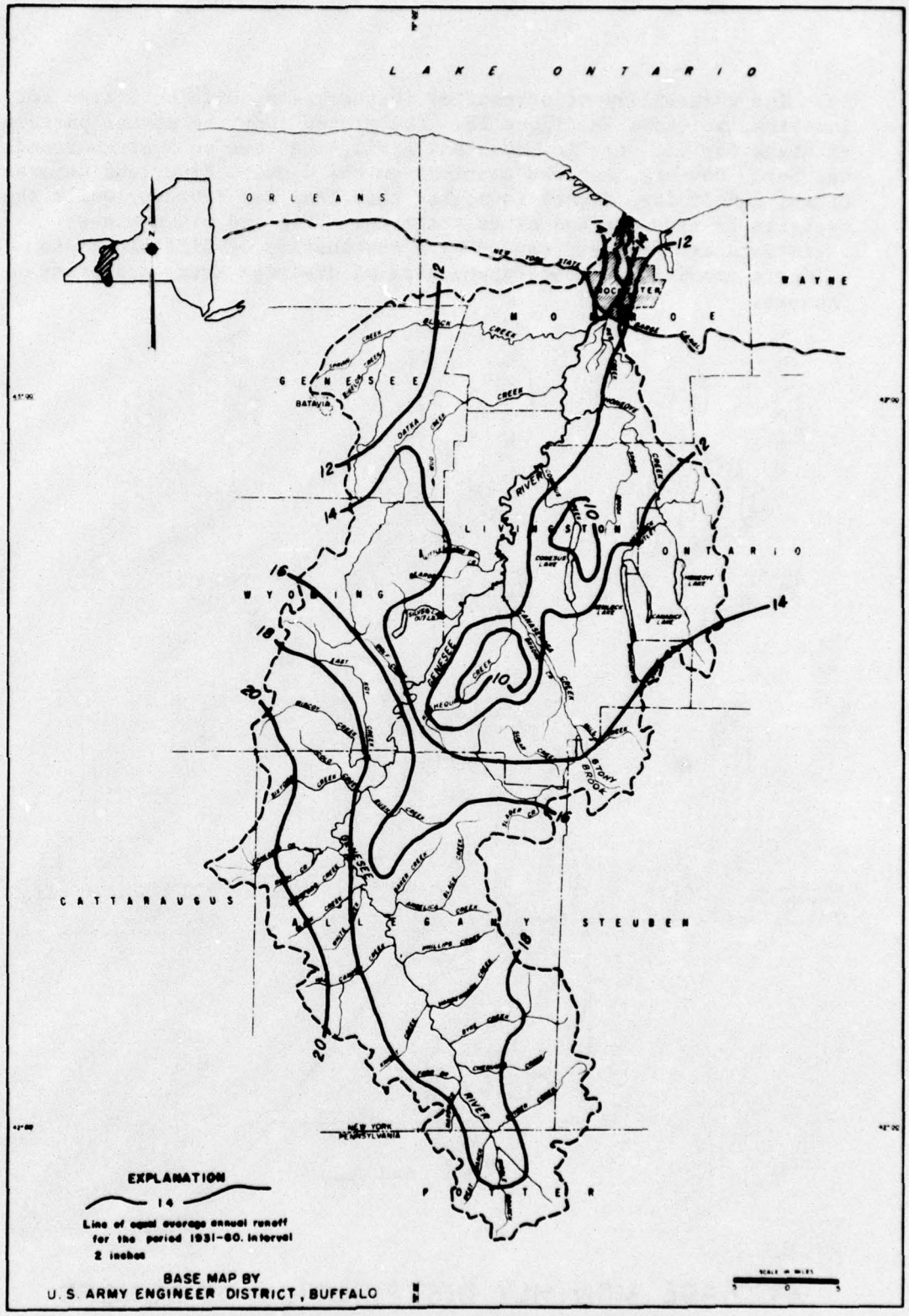


FIGURE 16

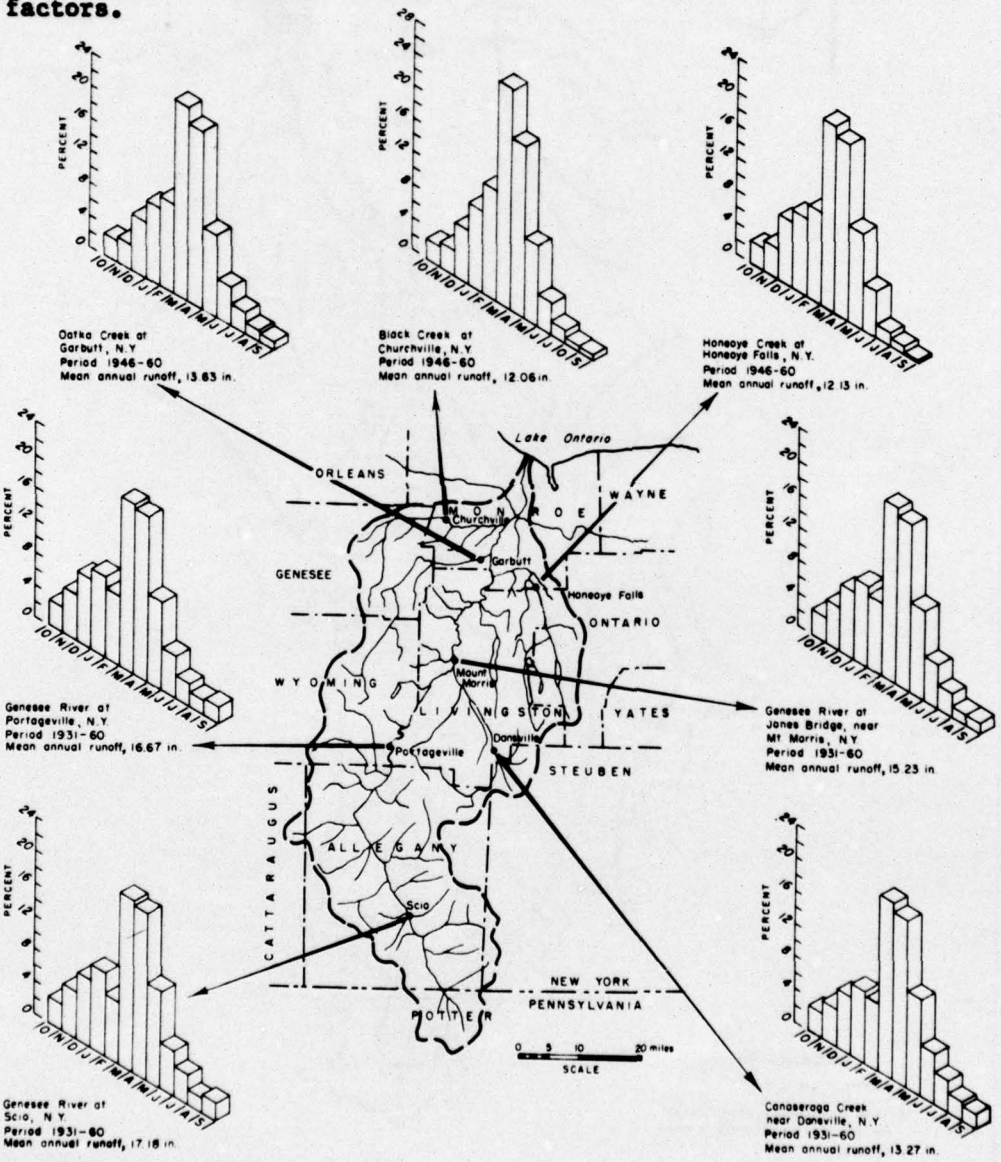
62. The areal pattern of average annual runoff is shown in figure 17. The isopleths of runoff are based upon all available streamflow data for the basin. The 14-inch isopleth at the mouth of the Genesee River at Rochester does not include the diversions from the New York State Barge Canal.



AVERAGE ANNUAL RUNOFF

FIGURE 17

63. The variability of streamflow in the basin, with both time and location, is shown in figure 18. The graphs show the normal pattern of highs for the year in March and April, and lows in September and October. However, for the stations on the Genesee River and Canaseraga Creek, runoff for January is higher than that for February while the opposite is true for the other stations. This and other minor variations are probably caused by a combination of differences in climatic conditions, topography, size of drainage area, and other factors.



AVERAGE MONTHLY DISTRIBUTION OF RUNOFF FOR SELECTED GAGING STATIONS

FIGURE 18

64. The areal pattern of low flow for the basin as shown in figure 19 resulted from the interpreting of low-flow frequency studies combined with all flow reconnaissance data.

65. Appendix "E," Hydrology and an attachment, "Duration, Frequency, and Distribution of Streamflow," to Appendix "H," discusses additional data on runoff and streamflow.

66. STORMS AND FLOODS OF RECORD

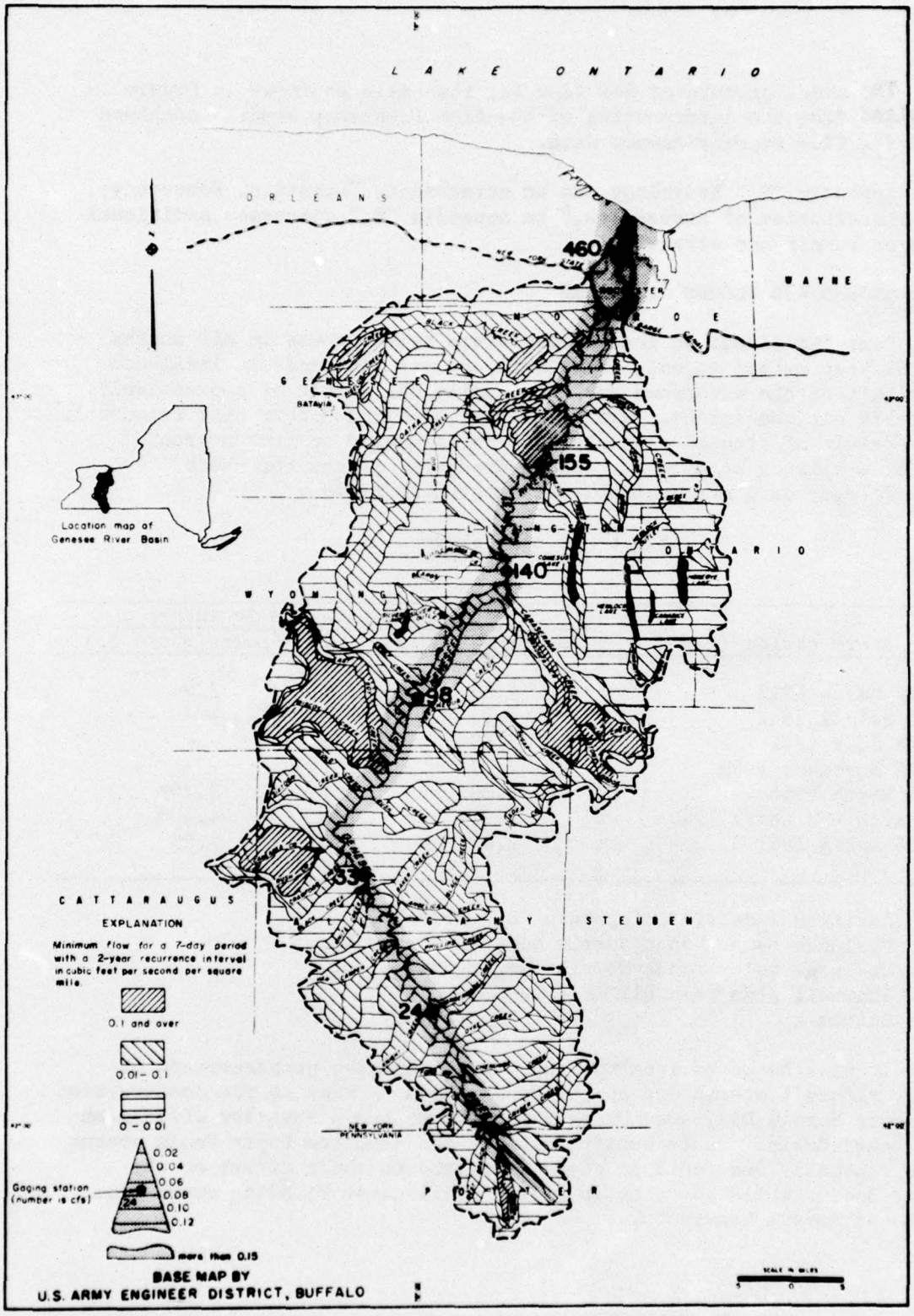
Damaging floods on the Genesee Basin have occured in all months of the year except August. Summer floods are, in general, localized in a part of the watershed and are usually the result of convectively unstable air conditions. Winter and spring floods occur most frequently as a result of frontal precipitation on saturated or frozen ground and or a melting snow cover. Flood producing storms for which meteorologic data are available are listed in Table 6.

TABLE 6 - Storms of record

Storm period (1)	Average Precipitation in inches	
	Upper Basin (2)	Lower Basin (3)
23-27 March 1913	4.93	3.94
7-10 July 1935	5.86	- -
17-18 July 1942	3.83	- -
24-25 November 1950	2.24	- -
6-10 March 1956	3.20+	3.20+
29 March - 2 April 1960	3.30*	4.10*
24-26 April 1961	2.47	2.25

(1) Additional details, Appendix "E," Hydrology
(2) Drainage above Mount Morris Dam, 1,077 sq. mi.
(3) Drainage below Mount Morris Dam, 1,390 sq. mi.
\+ Snowmelt plus rainfall
* Snowmelt

67. It will be noted from the above data that the preponderance of heavy rainfall storms are on the Upper Basin. Prior to the construction of Mount Morris Dam, even Upper Basin storms had disastrous effects on the Lower Basin. Since construction of the dam, the Upper Basin storms have virtually been held in check in regard to their effect on the Lower Basin, while Lower Basin storms still cause flooding downstream of Mount Morris Reservoir.



GENERALIZED DISTRIBUTION OF LOW FLOW

FIGURE 19

68. The maximum floods of record for all stations in the basin for which such data are available are shown in table 7. It should be noted that the maximum discharges at Jones Bridge and Rochester are nearly the same, even though the drainage area at Rochester is almost double that at Jones Bridge. This has occurred in the majority of floods prior to Mount Morris Reservoir due to a large amount of natural storage between Jones Bridge and Rochester.

69. FLOW FREQUENCY

Frequency curves are essential for the analysis of flood problems and for the determination of water supply and water quality problems. Thus the Corps of Engineers developed high flow curves for flood control purposes and the Geological Survey developed the necessary low flow curves for several water management purposes.

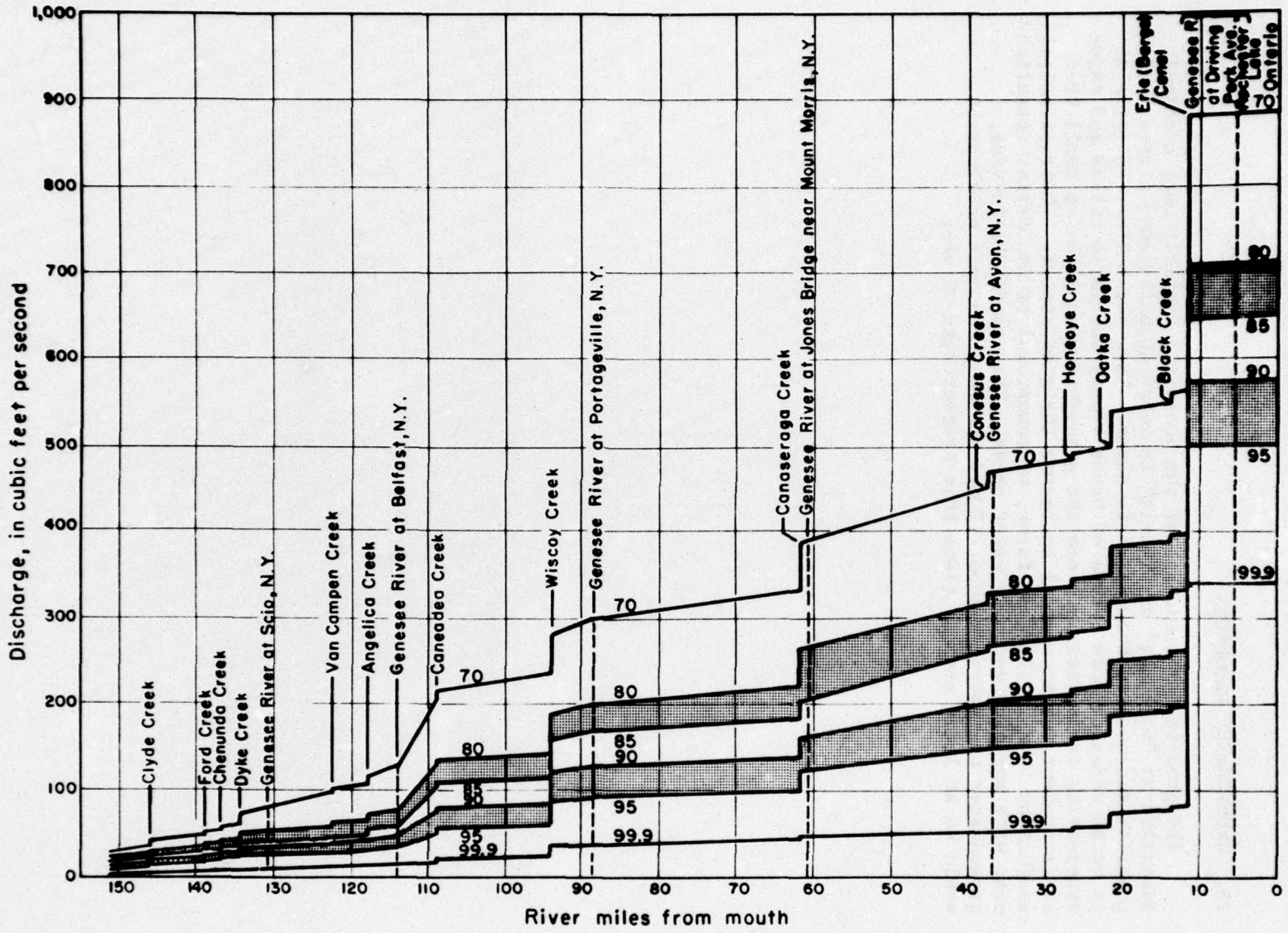
70. The determination of flood frequencies for the development of average annual damage depends on stream gaging records. There are eight stations in the Genesee River basin with periods of record long enough to analyze statistically. For those ungaged areas generalized frequency curves were developed for both the Upper and Lower Basin for two reasons. First, due to topographic differences between the Upper and Lower Basins, and second, due to the Lower Basin being presently protected by Mount Morris Reservoir. Details of the analysis are discussed and the frequency curves for the basin are shown in Appendix "E," Hydrology.

71. The low flow duration-frequency analysis are based on the minimum daily flows for various durations. These flows vary considerably from stream to stream in the basin because of geology, minor diversions and regulation, and the effect of summer showers. The low flow data were developed for eleven long-term gaging stations in the basin for periods ranging from 1 to over 200 consecutive days. These data and curves appear in the attachment, "Duration, Frequency and Distribution of Streamflow" to Appendix "H."

72. Figure 20 shows a profile of durations of flow for the Genesee River. The curves are based upon flow-duration data for the gaged sites on the main stem and data estimated for intervening areas. The diversions from the Barge Canal to the river may be noted at the downstream end of the profile.

TABLE 7 Maximum floods of record

Stream and place of determination	County	Drainage Area (sq mi)	Period of Record	Known Maximum				
				Date	Gage Height (feet)	Elevation (msl)	Discharge cfs	Discharge csm
Dyke Creek at Wellsville	Allegany	71.4	1955-60	June 15, 1960	16.10	1,508.28	5,230	73.2
Genesee River at Wellsville	Allegany	288	1955-58	Mar. 8, 1956	17.65	1,490.65	15,800	54.8
Genesee River at Scio	Allegany	309	1916-67	Nov. 25, 1950	11.22	1,450.05	23,300	75.4
S.Br. Van Campen Creek at Nile	Allegany	5.19		Aug. 1, 1950			3,280	632
Angelica Creek at Angelica	Allegany	61.0		July 18, 1942			14,000	230
Caneadea Creek at Caneadea	Allegany	61.5	1950-67	Sept. 28, 1967	13.09	1,251.16	13,800	222.6
Lost Nation Brook near Centerville	Allegany	1.12	1934-35	Jan. 9, 1935			49	44.5
Genesee River at Portageville	Wyoming	982	1909-67	May 17, 1916			44,000	45.2
Genesee River at St. Helena	Wyoming	1,017	1908-50	Mar. 7, 1956 May 17, 1916	21.70 12.81	1,104.30	44,400	43.7
Genesee River at Mount Morris	Livingston	1,078	1894-09	May 21, 1894			42,000	39.0
Stony Brook at Stony Brook Glen	Steuben	18.1		July 1935			5,800	320
Canaseraga Creek near Dansville	Livingston	153	1910-12, 1915-17, 1919-67	July 23, 1940	13.1	653.10	8,830	57.7
Canaseraga Creek at Cumminsville	Livingston	155	1917-19	July 23, 1940			9,110	58.8
Canaseraga Creek at Groveland	Livingston	181	1915-16, 1917-20, 1955-63	May 22, 1919 Mar. 7, 1956	13.71	579.13	4,380	24.2
Keshequa Creek at Craig Colony, Sonyea	Livingston	69.1	1910-12, 1917-32	Mar. 14, 1918			5,940	86.0
Keshequa Creek near Sonyea	Livingston	76.5	1915-17	Mar. 27-28, 1916			1,660	21.7
Canaseraga Creek at Shakers Crossing	Livingston	333	1915-22, 1959-67	May 17, 1916 Apr. 26, 1961	23.62 12.07	568.92 557.37	4,430	13.3
Genesee River at Jones Bridge, near Mount Morris	Livingston	1,419	1903-1906, 1908-1914, 1915-67	May 17, 1916	25.44	565.44	55,100	38.8
Beards Creek at Leicester	Livingston	12.4		Mar. 1, 1955			2,260	182
Conesus Creek near Lakeville	Livingston	72	1919-34	Dec. 1-2, 1927			625	8.7
Limekiln Creek near Springwater	Livingston	4.55		Aug. 9, 1953			2,130	468
Jess Brook at Springwater	Livingston	0.37		Aug. 9, 1953			165	446
Genesee River at Avon	Livingston	1,666	1955-67	Mar. 7, 1956	37.20	537.20	15,600	9.36
Honeoye Creek at Honeoye Falls	Monroe	197	1945-67	Mar. 28, 1950	6.42	616.40	4,630	23.5
Honeoye Creek at East Rush	Monroe	238	1903-06	Apr. 4, 1903			2,710	11.4
Oatka Creek near Warsaw	Wyoming	22.0		Mar. 1, 1955			1,760	80.0
Stony Creek near Warsaw	Wyoming	8.03		Mar. 1, 1955			1,080	134
Oatka Creek at Garbutt	Genesee	208	1945-67	Mar. 31, 1960	8.64	569.53	6,920	33.9
Black Creek at Churchville	Monroe	123	1945-67	Mar. 31, 1960	9.44	561.89	4,880	39.7
Genesee River at Elmwood Ave., Rochester	Monroe	2,450	1905-18	Mar. 30, 1916	12.3	519.15	48,300	19.7
Genesee River at Driving Park Avenue, Rochester	Monroe	2,467	1904-67	Apr. 2, 1940 Mar. 18, 1865	17.08		54,000	21.9



PROFILE OF DURATIONS OF FLOW FOR THE GENESEE RIVER

FIGURE 20

73. GROUNDWATER RESOURCES

The groundwater resources of the basin are probably most concisely described as "moderate" or "modest" in total quantity and "diverse" in quantity and quality from place to place. They are neither so large as to be an adequate sole source of water supply for large cities and major water-using industries, nor are the groundwater supplies so small that it is prudent and economical to ignore their existence. Their principal usefulness is for villages, farms, or commercial or industrial establishment with small or moderate water needs. The present basin-wide, groundwater use averages about 12 mgd and full economic development would be at least several times this present rate of use.

ECONOMIC DEVELOPMENT

74. GENERAL

The need for water and related land resource development, for the most part, is dependent upon the size and characteristics of the basin population and the level and mix of the economic activities. Special studies were made by various state and federal agencies in the fields of agriculture, forestry, geology and mineral resources, power and recreation. Although this report includes in its tabulations all of the employment in these activities, the special studies by the United States Department of Agriculture and Corps of Engineers provide insights and details that could not be given in a general study of the area economy. Their reports are published in Parts Two, Three and Four of Appendix "D," and constitute an integral part of the economic base study for the Genesee River Basin. They include: (a) "The Agricultural Economy of the Genesee River Basin," U. S. Department of Agriculture, Economic Research Service; (b) Projected Employment and Production in the Forest Industries in Economic Areas of the Genesee River Basin," U. S. Forest Service; and (c) Predominant Mineral Resources of the Genesee River Basin and Service Area," U. S. Army Corps of Engineers.

75. The State of New York chaired Task Group No. 1 which coordinated the entire economic base study, including the parts referred to above. A graphic breakdown of contributing reports and agencies is shown in figure 21:

76. GENESEE RIVER SERVICE AREA

Two different areas have been used as a basis for the economic studies presented in this study. The principal area is comprised of those counties which are partially, or wholly, within the watershed of the Genesee River. Adjacent counties were added where there were close economic ties binding them to river basin counties. The collection of counties thus formed constitutes the overall economic area. This economic area was further divided into economic subareas, which were composed of a group of counties possessing similar economic and sociological characteristics. The subarea breakdown is as follows:

(a) Barge Canal - Monroe (Metropolitan Area), Orleans and Wayne Counties;

(b) Central Plain - Genesee, Livingston, Ontario and Wyoming Counties; and

GENESEE RIVER BASIN

CONTRIBUTING REPORTS AND AGENCIES

APPENDIX D

ECONOMIC BASE STUDY

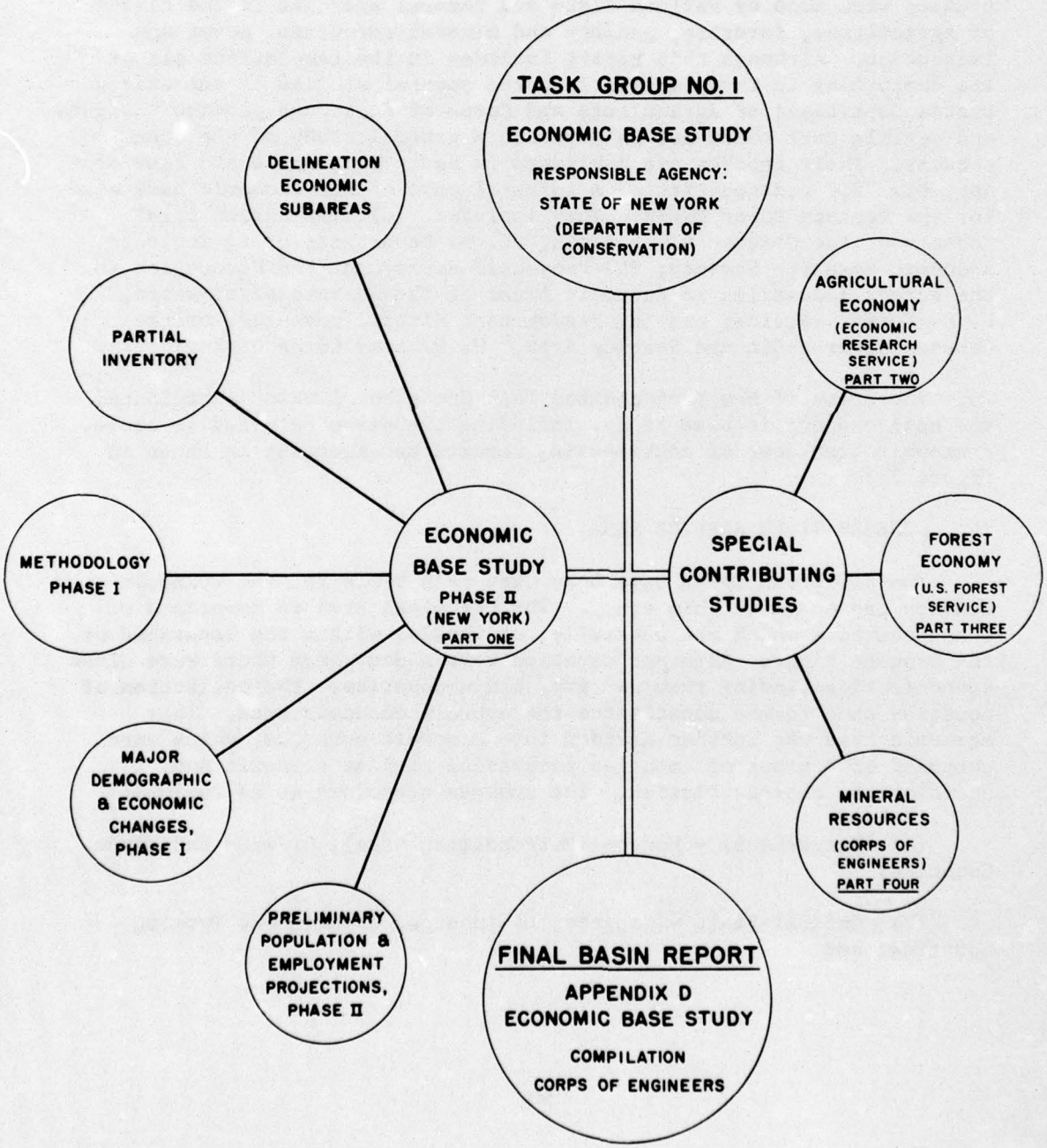


FIGURE 21

(c) Allegheny Plateau - Allegany, Cattaraugus, Steuben and Potter Counties.

Of the above counties, all lie within the State of New York, with the exception of Potter County, which is in the Commonwealth of Pennsylvania. The economic area covers approximately 8,943 square miles. These subareas are shown in figure 22.

77. POPULATION

The number of persons living in an area is a yardstick of that area's economy. In 1930 the population of the Genesee River Basin economic area was 878,322. By 1960, it had increased to 1,127,784, or about 28 percent. By 2010 the population of the basin is projected to reach 1,961,384 or approximately 1.7 times the 1960 level, and by 2020 it is projected to be 2,156,791 or 1.9 times the 1960 level.

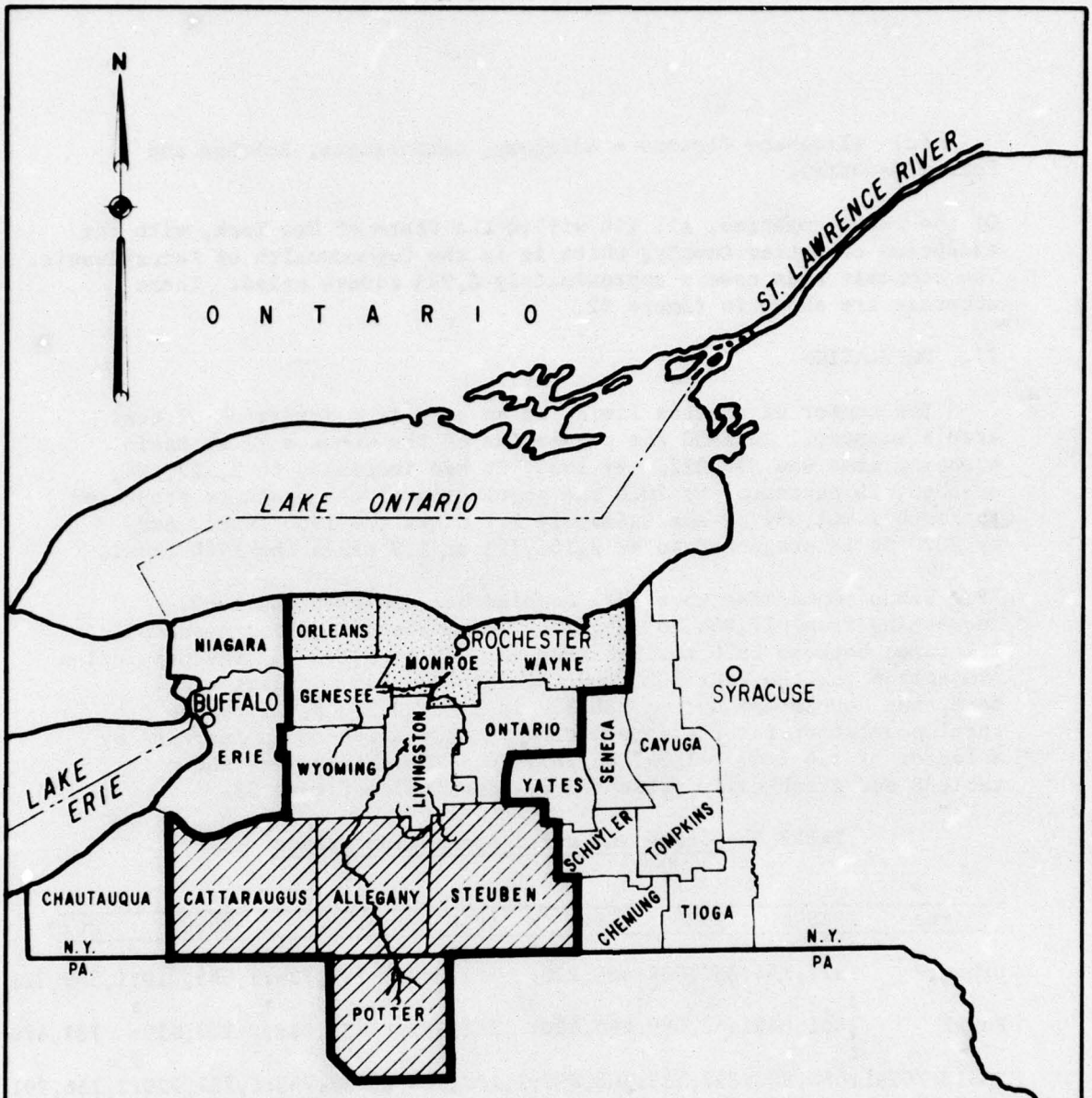
78. Urban population more than doubled between 1900 and 1960, increasing from 217,854 to 586,387. Rural population increased only 1.2 times between 1900 to 1960 from 451,049 to 541,397. The population projection for the year 2020 indicates that urban population will more than double again from 586,387 in 1960 to 1,369,321, while rural population for the same period is only expected to increase by a factor of 1.4 from 541,397 to 787,470. These facts are shown in table 8 and graphically presented by counties on figure 23.

TABLE 8 - Urban and rural population trends

Area	1900	1920	1940	1960	1980	2000	2020
Urban	217,854	352,034	438,230	586,387	799,733	1,065,310	1,369,321
Rural	451,049	445,099	465,660	541,391	637,022	722,610	787,470
BASIN TOTAL	668,903	797,133	903,890	1,127,784	1,436,755	1,787,920	2,156,791

79. TOTAL EMPLOYMENT

The labor force which is available within a basin population, determines the number of potential employees of the basin. In turn, the productivity of labor through employment is an indication of the income flow that the basin's economy can generate.



ECONOMIC AREA AND SUBAREAS

FIGURE 22

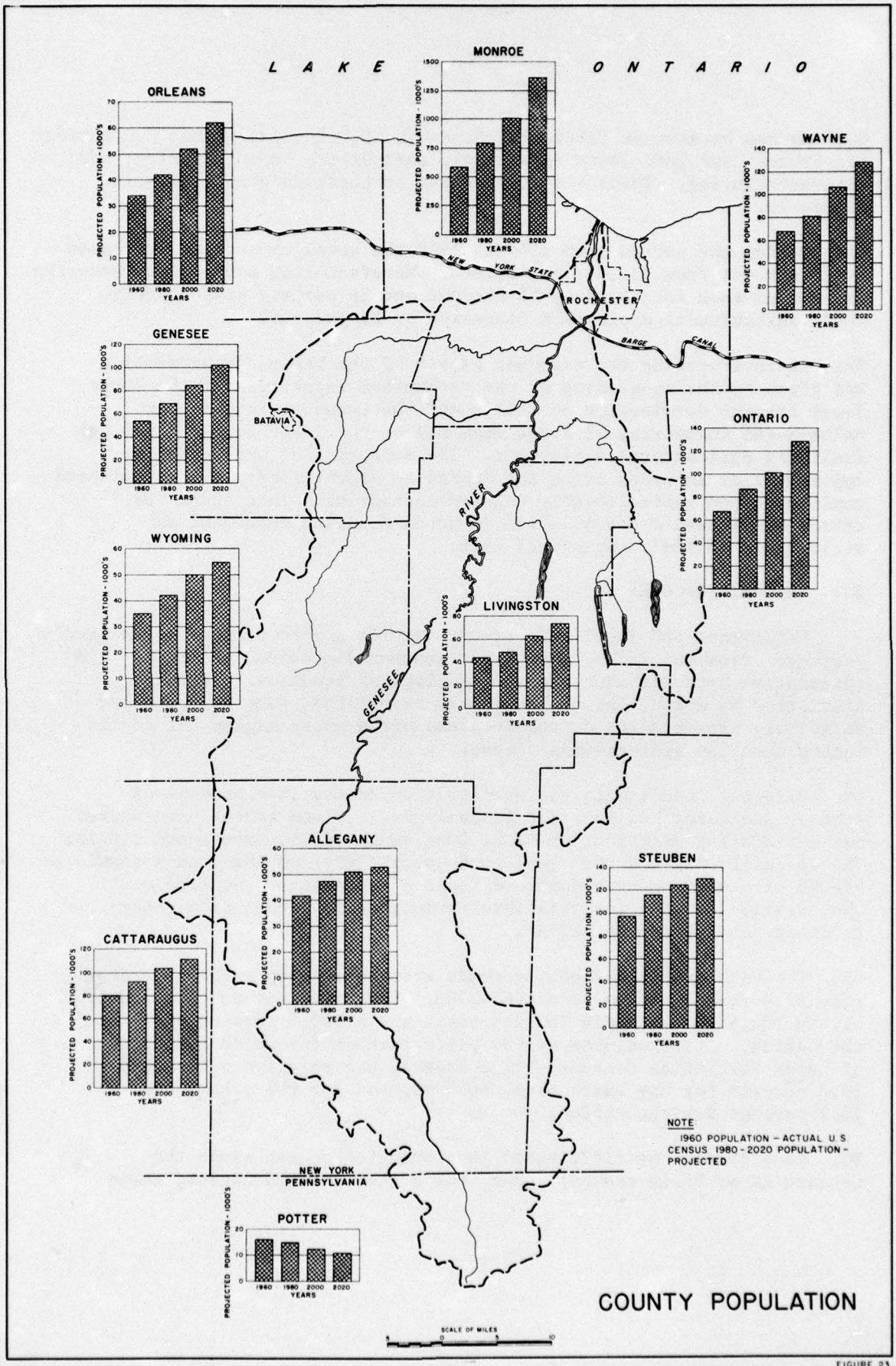

LAKE ONTARIO
ORLEANS
MONROE
WAYNE
NEW YORK STATE
ROCHESTER
BARGE CANAL
GENESEE
BATAVIA
ONTARIO
RIVER
WYOMING
LIVINGSTON
GENESEE
ALLEGANY
STEUBEN
CATTARAUGUS
NEW YORK
PENNSYLVANIA
POTTER
PROJECTED POPULATION - 1000'S
YEARS
1960 1980 2000 2020
SCALE OF MILES
NOTE
1960 POPULATION - ACTUAL U.S. CENSUS 1980 - 2020 POPULATION - PROJECTED
COUNTY POPULATION

FIGURE 23

80. As can be seen on table D25, Appendix "D," the employment projections are broken down into three categories, agriculture, manufacturing, and nonmanufacturing. These projections can be observed graphically in figure 25.

81. During the period from 1940 to 1960 the total employment increased by 31 percent from 323,637 to 424,060. Manufacturing and nonmanufacturing employment each increased by 55 percent and 36 percent respectively, while agricultural employment decreased by 21 percent.

82. In interpreting the economic growth of the basin, consideration was given to the up-grading of the productive capacities of the labor force through development of skills and the transfer into higher value-added industries of large segments of the labor force, freed by declining agricultural employment. The expansion of employment opportunities in urban areas has tended to offset losses in agricultural employment and agriculturally related industries. This trend has caused considerable depopulation in rural counties dependent on agriculture as their employment base.

83. PERSONAL INCOME

Employment and population trends provide a good picture of an area's economy. Personal income levels add another dimension, providing comparative data for counties or groupings of counties. Further, statistics on actual income levels may reveal that some of the older relatively slow-growing or stable areas often enjoy higher per capita income than the fast-growing places.

84. Personal income data are available by county in a handful of states, including New York and Pennsylvania. These states have worked out methods for distributing U. S. Department of Commerce state totals. The so-called "allocators" vary in dependability and these data should be viewed with some understanding of their shortcomings. Nonetheless, they provide helpful insights into variations in income from county to county and region to region.

85. The Genesee River Basin economic area chalked up a 101.5 percent rise in personal income from 1948-1963. This rise compared favorably with a 104.6 percent gain for the state and a 120.6 percent rise for the nation. After adjustment for price changes (measured by the Bureau of Labor Statistics Consumer Price Index), the relative gains were 58.0 percent for the basin area, 60.8 percent for the state, and 73.2 percent for the nation.

86. Considering the differences in population growth among the Genesee River Basin economic area, the state, and the nation, these

comparative percentage changes are largely explained. The per capita personal income data, after adjustment for changes in value of the dollar, clearly show this. The "real" per capita personal income of residents of the basin area was up 24.0 percent, against 30.0 percent for the state and 34.0 percent for the nation. Excluding the New York Metropolitan Area from the state data, the corresponding increase for the "upstate" area was 23.1 percent. Table 9 shows the "real" per capita personal income by county for the basin for the same period as the above percentages.

TABLE 9 - Real per capita personal income by county (1)

County	1948	1963	1948-1963 Percent Change In Real Per Capita Income
Monroe	$2,415	$2,959	+22.5
Orleans	1,729	2,158	+26.4
Wayne	1,852	2,406	+29.9
Genesee	1,912	2,278	+19.1
Ontario	1,884	2,354	+24.9
Livingston	1,699	2,211	+30.1
Wyoming	1,568	2,064	+31.6
Cattaraugus	1,645	1,956	+18.6
Allegany	1,446	1,802	+24.6
Steuben	1,768	2,180	+23.2
Potter, Pa (2)	1,331	1,880	+42.0

(1) "Real" personal income -- actual dollar totals adjusted by Bureau of Labor Statistics' Consumer Price Index (1963=100) to remove the influence of price changes.
(2) Data for Potter, Pa. are for 1947 and 1963.

87. MAJOR WATER-USING INDUSTRIES

A review of the data presented in table 10 illustrates drastically the impact of Monroe county, containing the city of Rochester, on the present and future demands for industrial water compared to other counties within the Basin.

TABLE 10 - Industrial water demand by county

County	1965		1980		2020	
	MGD	%	MGD	%	MGD	%
Monroe	202.9	96.8	237.6	96.0	319.6	95.7
Livingston	2.0	.9	2.9	1.2	4.4	1.3
Allegany	.6	.3	1.0	.4	1.4	.4
Wyoming	1.8	.9	3.0	1.2	4.6	1.4
Genesee	1.2	.6	1.8	.7	2.4	.7
Ontario	1.0	.5	1.3	.5	1.9	.5
Steuben	0.01	0	0.01	0	0.01	0
Potter, Pa.	0.0	0	0.0	0	0.0	0
TOTAL	209.51	100.0	247.61	100.0	333.91	100.0

88. The bulk of the present total demand is supplied by the city of Rochester, Monroe County Water Authority and private industrial sources.

89. The following is a list of some of the major water-using industries in the Genesee River Basin with their locations:

Ainsbrook Corps.	Rochester
Birdseye	Avon
Borden's Food Co.	Whitesville
Conesus Milk Products	Nunda
Curtice Burns	Bergen
Curtice Burns	Mt. Morris
Dairymen's League	Groveland
Eastman Kodak	Rochester
Foster Wheeler	Dansville
Friendship Dairies	Friendship
Lapp Insulator	Leroy
Leroy Elm Dairy	Leroy
Lucidol Chemical	Piffard
Perry Knitting	Perry
Sunnydale Farms	Andover

90. Prediction of future demand for self-supplied industrial water and that supplied by small communities is more difficult than projecting nonindustrial use. Contact with the various industries within the Basin outside of Monroe County revealed poor records on present and past usage of water and lack of planning for future use.

91. Water use indices were developed for each of the major water using industries in the Rochester Standard Metropolitan Statistical Area.

The resultant indexes for the SMSA were as follows:

	1965	1980	2020
Food and Kindred Products (SIC 20)	100	133	194
Chemical and Allied Products (SIC 28)	100	149	243
Paper and Allied Products (SIC 26)	100	117	144
Primary Metals (SIC 33)	100	119	159
Other Industries	100	173	266

The larger index numbers for "Other Industries" is due to more rapid growth in employment projected for such industries. The current water use base for such industries is probably relatively small. Employment projections for these activities were made through the year 2020, and are presented in table D27, Appendix "D."

92. NONMANUFACTURING ACTIVITIES

Nonmanufacturing activities considered in this report include mining, construction, transportation. wholesale and retail trade, finance, insurance, real estate, services, and public administration. Employment projections for these activities were made through the year 2020, and are presented in table D26, Appendix "D."

93. MINERAL ECONOMY

Mineral production is an important resource for the economy and growth potential of the region. The main commodities produced are salt, gypsum, stone, sand and gravel, and natural gas. These commodities are discussed by county for the economic study area in Appendix "D," Part IV and the projected water requirements for the mineral industry are presented in table 7 of the above appendix. The employment projections for the mineral industry are included under nonmanufacturing activities as mining.

94. AGRICULTURE

Total agriculture production on the Genesee River Basin in a large measure is dependent upon the acreage of crops grown, the yields per

acre, the number of livestock on farms and the production per animal. However, farmers in the Basin import fairly large quantities of grain and grain by-products from other areas in the United States and the quantity imported can be expected to increase in the future. This imported grain allows farmers in the Basin to expand output of livestock and livestock products far beyond the level which the use of Basin resources would allow.

95. In crop production from 1939 to 1959, corn harvested for grain increased substantially, while corn silage, hay, oat and wheat production increased to a lesser degree, but production of dry beans, potatoes, fruit and vegetables declined.

96. TRANSPORTATION

The Genesee River Basin is adequately served by the present road system which is shown on figure 24. The Basin in the northern portion is traversed from east to west by the New York State Thruway (Interstate 90) and the Southern Tier Expressway will cross the southern portion. The Expressway is presently in the design and/or construction stage. The Basin is traversed in the north-south direction by U. S. highway 15. An expressway, the Genesee, has been proposed to connect the New York State Thruway with the Southern Tier Expressway. This expressway should meet the future requirements of the Basin.

97. Railroad passenger service in the Basin has declined rapidly in recent years as it has in most of the northeastern portion of the United States. Rochester is the main city served by passenger service. The Basin does have sufficient freight service supplied by the following major railroads, Penn-Central, Erie-Lackawanna, Baltimore and Ohio, Lehigh Valley and a local railroad, the Wellsville, Addison and Galeton.

98. Commercial passenger and air freight transport are available at the Rochester-Monroe County airport. The airport is served by the following airlines, American, United and Mohawk.

99. Commercial navigation, both shallow draft and deep draft, is available at Rochester, but was not considered as related to basin development in the present study. Shallow draft navigation is provided by the New York State Barge Canal which transverses the northern portion of the basin from west to east. Terminal facilities are maintained on the Genesee River just south of Court Street Dam in Rochester. In the past, the Barge Canal was a major economic factor in the growth of Rochester and the Lake Plain area. Today commercial traffic is rapidly declining although pleasure craft traffic is steadily increasing. Deep draft commercial navigation is maintained in the last three miles of the Genesee River for the Port of Rochester. The port facilities serve both lake and ocean vessels with the principal products being coal, salt and newsprint.

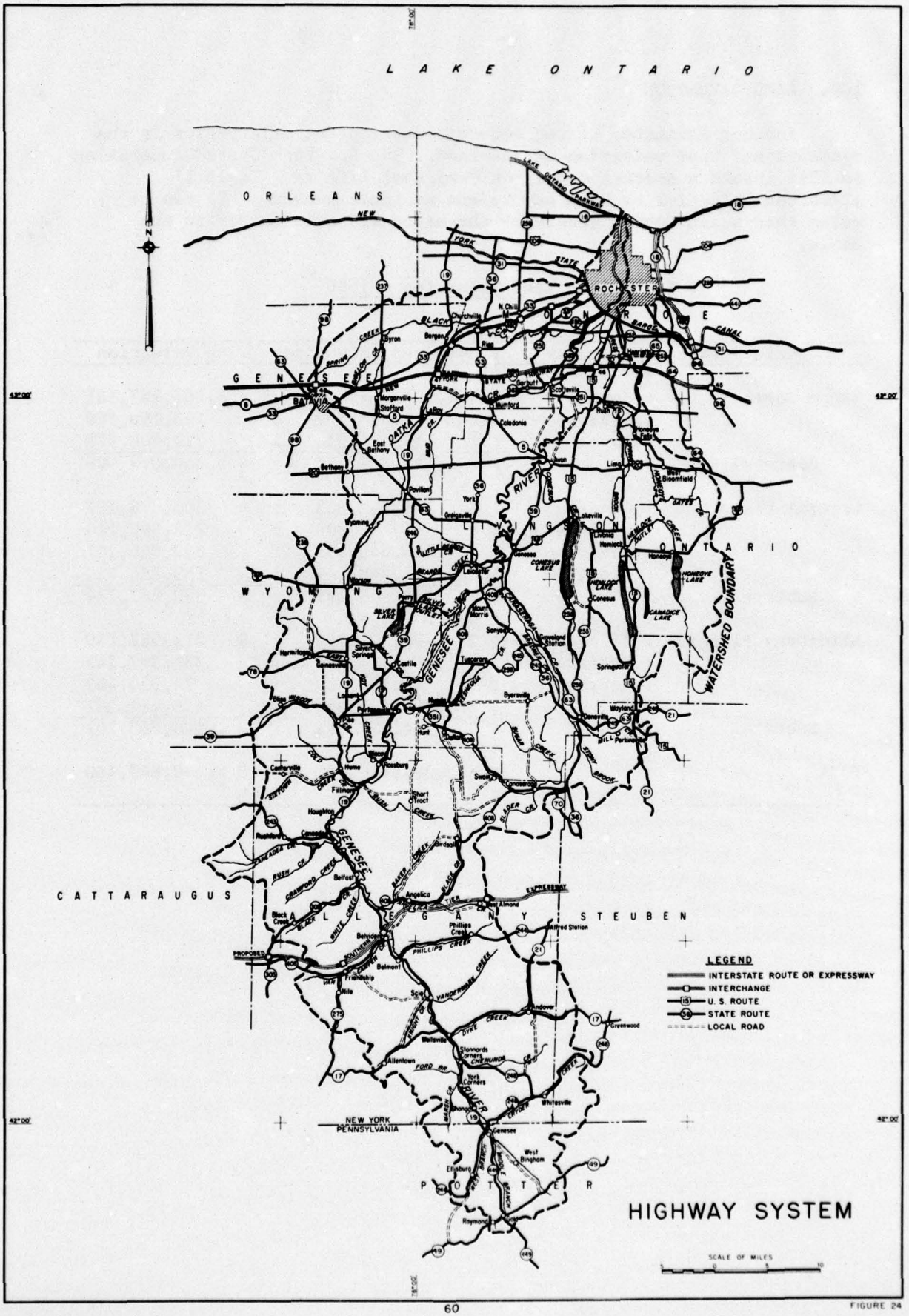

LAKE ONTARIO
ORLEANS
GENESEE
MONROE
ONTARIO
WYOMING
CATTARAUGUS
ALLEGANY
STEUBEN
PENNSYLVANIA
POTTER
NEW YORK
ROCHESTER
BUFFALO
GENESEE
ERIE CANAL
WATERSHED BOUNDARY
LEGEND
INTERSTATE ROUTE OR EXPRESSWAY
INTERCHANGE
U. S. ROUTE
STATE ROUTE
LOCAL ROAD
HIGHWAY SYSTEM
SCALE OF MILES

FIGURE 24

100. LAND VALUATION

Another indicator of the economic development of a region is the assessed and true valuation of the land. The New York State Comptroller in 1961 issued a special report on Municipal Affairs. Table 11 gives the valuation by both county and economic subarea. It can be noted that again Monroe County is the major economic factor in the Basin.

TABLE 11 - Land valuation - 1960

Economic Subarea	County	Assessed Valuation	True Valuation
Barge Canal	Monroe	$ 1,306,734,510	$ 3,187,157,341
	Orleans	62,990,703	143,160,680
	Wayne	115,094,512	319,706,978
Subtotal		$ 1,484,819,725	$ 3,650,024,999
Central Plain	Genesee	$ 109,232,805	$ 206,078,107
	Livingston	95,762,808	212,806,240
	Ontario	164,645,595	357,925,207
	Wyoming	73,348,941	159,454,220
Subtotal		$ 442,990,149	$ 990,263,774
Allegheny Plateau	Allegany	$ 91,122,272	$ 211,912,260
	Cattaraugus	143,791,029	334,397,742
	Potter	13,583,435	32,036,403
	Steuben	206,502,865	430,214,302
Subtotal		$ 454,999,601	1,008,560,707
TOTAL		$ 2,382,809,475	$ 5,648,849,480

PROJECTED ECONOMY

101. NATIONAL

With the exception of the Rochester metropolitan area the Genesee River Basin is basically an agricultural area. National estimates of the demand for agricultural products as determined from population growth and per capita consumption trends are given in Appendix "D," Part II, table 5. These requirements are shown as indexes in Appendix "D," Part II, table 4.

102. Projected requirements indicate that by 2020 the output of livestock products will need to be more than three times the 1960 output and for crops more than double the 1960 level.

103. The National Economic Growth Projection for population furnished by the Economic Task Force of the Ad Hoc Water Resources Council Staff for use in this study is 1.72 percent per year, while National Planning Association projections for the nation were 1.69 percent.

104. These national population projection rates appeared too high, to the Genesee Economic Task Group, in light of recent Census Bureau population projections. The arithmetic mean of the "B" and "C" Census Bureau projections is 1.47 percent. In view of the downward revision in population growth, the 1.47 percent population growth rate weighed heavily in the final projections of population and employment for the Genesee basin.

105. REGIONAL

Regional output for the seven states comprising the Middle Atlantic Region were determined so that consideration was given to interregional advantages or disadvantages in the production of various farm products.

106. Middle Atlantic production as a percent of a National production is given in Appendix "D," Part II, table 6, and projected production is given in Appendix "D," Part II, table 7. Percentages beyond 1980 are assumed to be unchanged.

107. GENESEE RIVER BASIN ECONOMIC AREA

The general picture of the Genesee River Basin that emerges from the statistics is one of differential growth. Historic trends are expected to continue, by and large. The greater Rochester area should closely parallel the nation's growth while the Central Plains and

Allegheny Plateau will, most likely, continue to lag. To qualify this general statement, a comparison was made between growth rates projected for the Genesee River Basin and the nation. For total employment only Monroe County (Rochester Metropolitan Area) approaches the nation's projected rate of growth, while the upstream subareas are expected to expand jobs at rates of around half that of the United States. A similar relationship is obtained for population in the Basin's economic area versus the nation. Table 12 shows the projected annual growth rates used in the study for both population and employment. These population and employment projections were selected from a family of projections obtained by three basic techniques. The techniques used for population were cohort survival, historic trends and share of the nation. The techniques used for employment were trend analysis, share of the nation and shift analysis. These techniques and methodology are discussed in Appendix "D," Part I.

TABLE 12 - Population and employment growth rates

Area & Subarea	Projected Annual Growth Rates in Percent			
	Total population	Total employment	Manufacturing employment	Nonmanufacturing employment
Basin Economic Area	1.09	1.25	.65	1.66
Barge Canal	1.37	1.50	.79	1.94
Rochester SMSA	1.42	1.54	.75	1.99
Wayne & Orleans	1.04	1.25	1.12	1.62
Central Plains	.63	.84	.22	1.26
Allegheny Plateau	.43	.61	.27	.92

108. Future agricultural product output for the Genesee River Basin is based on past trends in Basin production relative to the Middle Atlantic Production.

109. ECONOMIC SUBAREAS

Projections of agricultural product output for the Economic Subareas were made by extending past trends in the Basin's share of Middle Atlantic production as determined from an examination of county census data. Projections are given in the dollar value of production expressed in terms of 1960 price levels.

110. Projections of agricultural product output for the Basin's drainage area were derived in the same manner. These projections are shown in the United States Department of Agriculture portion of Appendix "D." Because of the Basin's small size, it was necessary to use census data for towns. Town data were further broken down on a part-town basis, where necessary, in order to make the best estimates of production in the Basin's watersheds as delineated by the Soil Conservation Service. Data were summarized for the Basin's two Land Resource Areas. Final projections are expressed in quantities of products rather than in dollars.

111. It is estimated that two of the Economic Subareas will experience a decline in the percentage of Basin agricultural production, the Metropolitan Area and the Allegheny Plateau Area. Urban expansion in the Metropolitan Area is expected to take much of the cropland out of agriculture. Shifts out of agriculture of less productive lands in the Allegheny Plateau Area will cause decline in the value of production in that area. The remaining two Economic Subareas, Central Plain Area and Barge Canal Area, are expected to gain in percentage of total Basin production.

112. The employment projections for the Basin and each of the subareas for manufacturing, nonmanufacturing, agriculture and total employment as described in the preceding paragraphs are shown graphically in figure 25.

113. EXTERNAL AREAS OF INFLUENCE

The entire Allegheny Plateau Subarea of the Genesee Study is included in economic subregions 1 and 2 under the Appalachian Study. For the Appalachian Study, population, employment, and per capita income projections were prepared for each of these economic subregions. The initial projections were based on historical trends. While these projections have built into them elements reflecting technological change and the influence of long-run efforts and investments toward regional development, they do not reflect the economic expansion which the Appalachian Regional Development Act of 1965 envisioned as obtainable through careful coordination of development programs. The Office of Appalachian Studies, Cincinnati, Ohio calculated developmental "benchmarks" to ascertain and describe how much growth must occur in Appalachia if the region is to reach a semblance of parity with the rest of the nation. These benchmarks are projections of population, employment, and income growth which indicate what the water demand will be if the total Appalachian development investment effort brings the economy to a higher level of activity. The initial projections, the "benchmarks," and the differences between them, the "lag," give a generalized picture of the economic prospects for public investment return in the economic subregions.

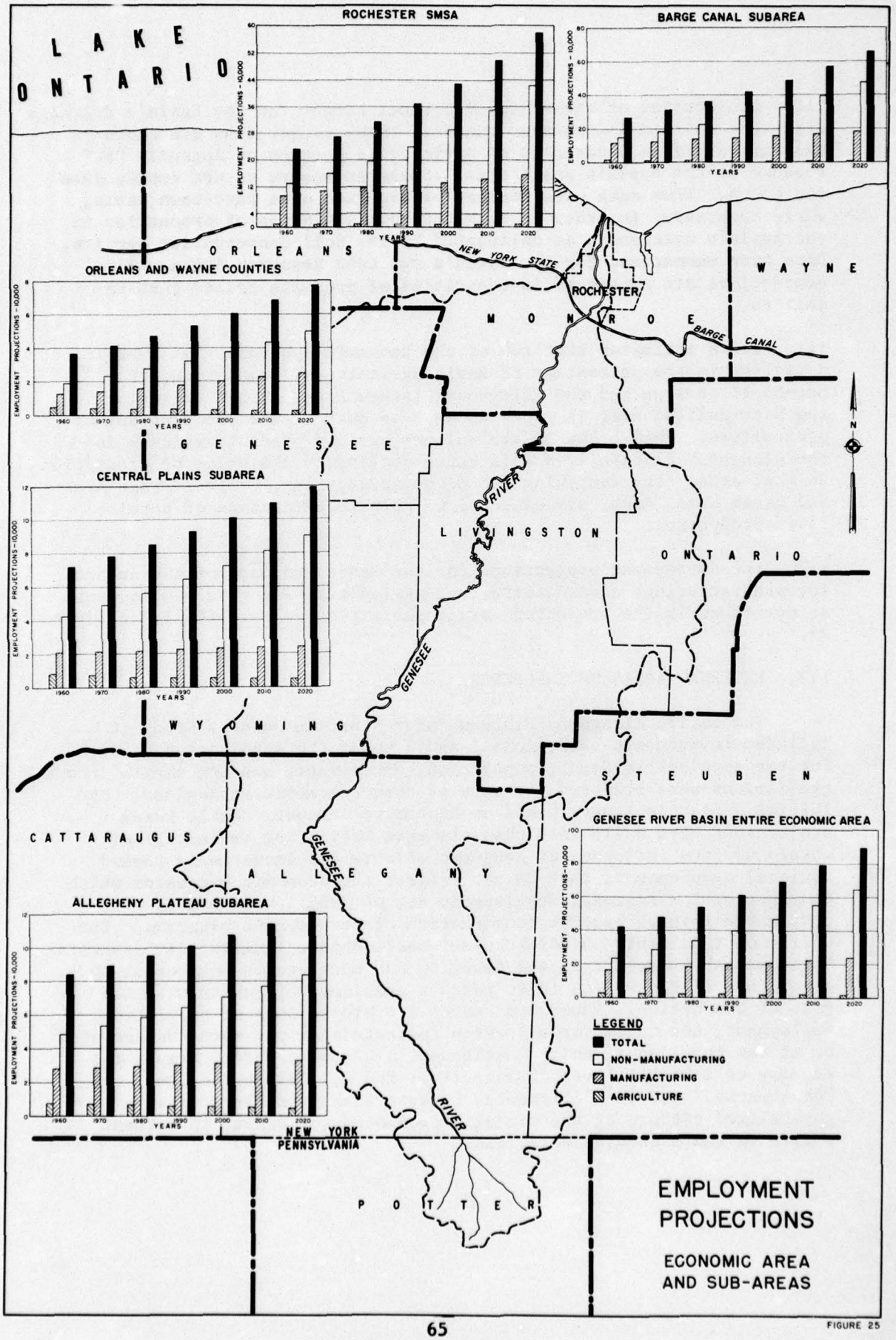

LAKE ONTARIO
ROCHESTER SMSA
BARGE CANAL SUBAREA
EMPLOYMENT PROJECTIONS - 10,000
YEARS
ORLEANS
NEW YORK STATE
ROCHESTER
WAYNE
MONROE
BARGE CANAL
ORLEANS AND WAYNE COUNTIES
GENESEE
CENTRAL PLAINS SUBAREA
RIVER
LIVINGSTON
ONTARIO
N
GENESEE
WYOMING
STEUBEN
GENESEE RIVER BASIN ENTIRE ECONOMIC AREA
CATTARAUGUS
ALLEGANY
ALLEGHENY PLATEAU SUBAREA
LEGEND
TOTAL
NON-MANUFACTURING
MANUFACTURING
AGRICULTURE
NEW YORK
PENNSYLVANIA
POTTER
EMPLOYMENT PROJECTIONS
ECONOMIC AREA AND SUB-AREAS

FIGURE 25

114. Projects evaluated under the Appalachia Study included an analysis of both user and expansion benefits which result from induced investments. Under this study, construction of a multiple-purpose reservoir project on the Genesee River, south of Wellsville, was found to be economically feasible, but under the Genesee Basin study criteria it was not economically feasible. The Stannard Reservoir would provide the services needed to satisfy the water related needs of the area, and thereby encourage development of the upper Genesee River Basin. The specific benefits realized from the project would be for flood damage reduction, water supply for industrial use and irrigation, water quality control, fish and wildlife enhancement, and economic development. Economic development of the area of influence of the project would be supported through provision of additional job opportunities, both during and after project construction.

NEEDS FOR WATER AND RELATED RESOURCE DEVELOPMENT

115. INTRODUCTION

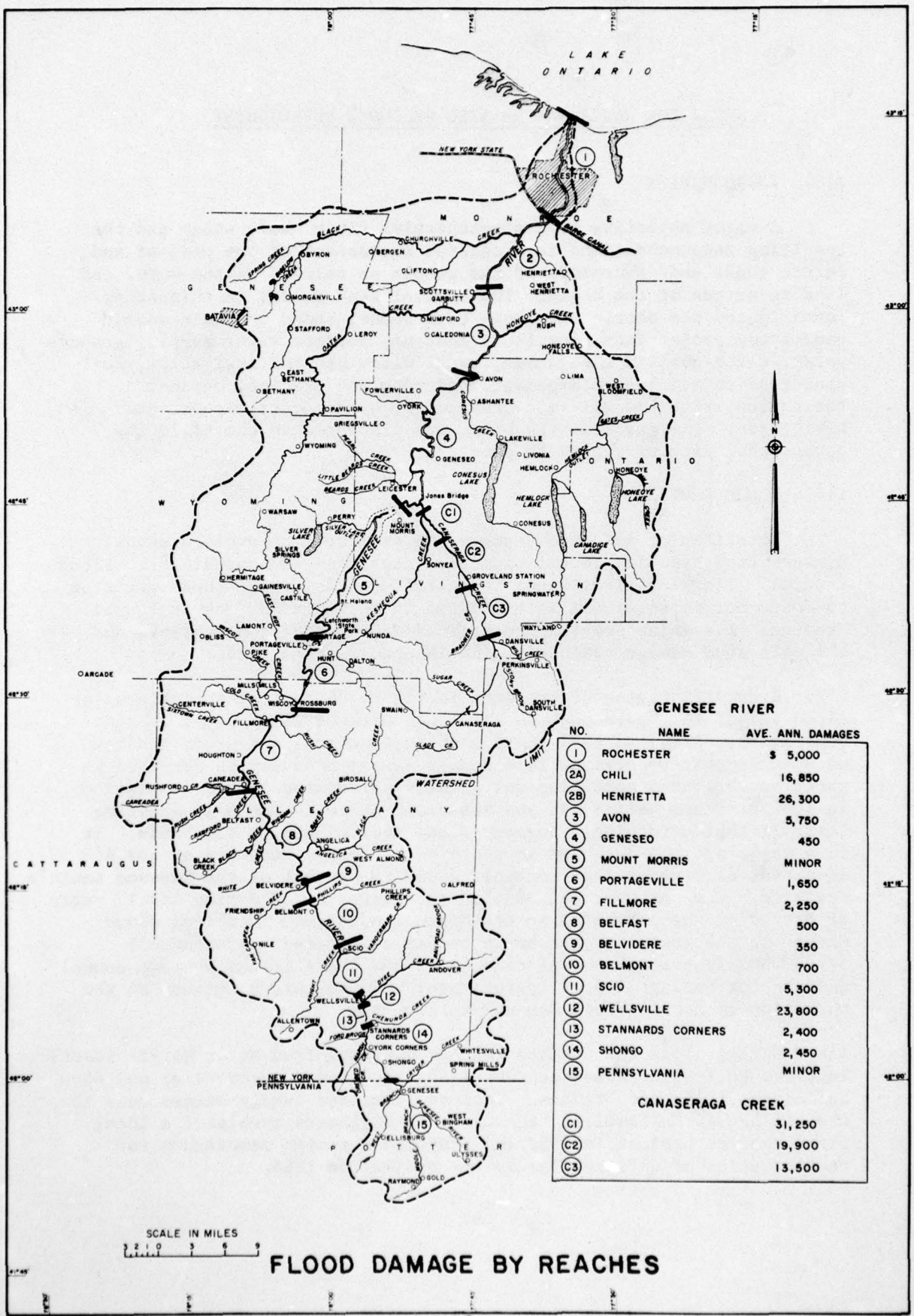
A major objective of a comprehensive river basin study and the resulting recommendations is a careful assessment of the present and future needs and/or demands of the people as related to the water and land resources of the basin. The several task groups in this study investigated the short- and long- term needs, based on the economic base study projections, for flood control, surface water supply, groundwater, water quality management, rural water use and irrigation, soil conservation and land management, sediment and erosion, outdoor recreation, fish and wildlife management, hydroelectric power and navigation. The needs in the basin are discussed in the following paragraphs, without regard to priority.

116. FLOOD CONTROL

Locations of affected reaches and estimates of average annual damages from flooding in the basin are contained in Appendix "F," Flood Control. Flooding along upper basin tributaries, i.e., those upstream of Mount Morris Reservoir is evaluated in Appendix "J," Agricultural Studies. The major problem areas cited in succeeding paragraphs and the main stem damage reaches can be located on figure 26.

117. A careful review of the data in figure 26 indicates little major flood damage in the reaches on the lower Genesee River under present conditions. Prior to 1951 these rich agricultural and urban reaches were vulnerable to severe flood damage almost annually as observed in photo No. 8. This condition was greatly alleviated by the completion in 1951 of Mount Morris Dam and Reservoir which is the only existing Corps of Engineers single purpose flood control dam in the basin. It is a major project as shown in photo No. 9 with a capacity of 337,400 acre-feet of storage that controls about 44 percent of the Genesee basin's drainage. The dam cost $23,365,559 to construct and during its 17 years of operation has prevented an estimated $16,000,000 in direct flood damage in the lower Genesee basin or has eliminated approximately $1,000,000 in average annual damages. Thus the existing average annual damages for reaches 1-5 of approximately $55,000 are a tribute to the operation of Mount Morris Dam and Reservoir.

118. Damage along the Genesee reaches upstream from Mount Morris reservoir involves agricultural and pasture lands, scattered residential and farm buildings, roads and bridges. Intense localized damage occurs only at the village of Wellsville. The Corps of Engineers completed a local flood control project in 1957 and prepared a design memorandum for rectification of deficiencies in the project in 1966.



NO.	NAME	AVE. ANN. DAMAGES
1	ROCHESTER	$ 5,000
2A	CHILI	16,850
2B	HENRIETTA	26,300
3	AVON	5,750
4	GENESEO	450
5	MOUNT MORRIS	MINOR
6	PORTAGEVILLE	1,650
7	FILLMORE	2,250
8	BELFAST	500
9	BELVIDERE	350
10	BELMONT	700
11	SCIO	5,300
12	WELLSVILLE	23,800
13	STANNARDS CORNERS	2,400
14	SHONGO	2,450
15	PENNSYLVANIA	MINOR
	CANASERAGA CREEK	
C1		31,250
C2		19,900
C3		13,500

FLOOD DAMAGE BY REACHES

FIGURE 26

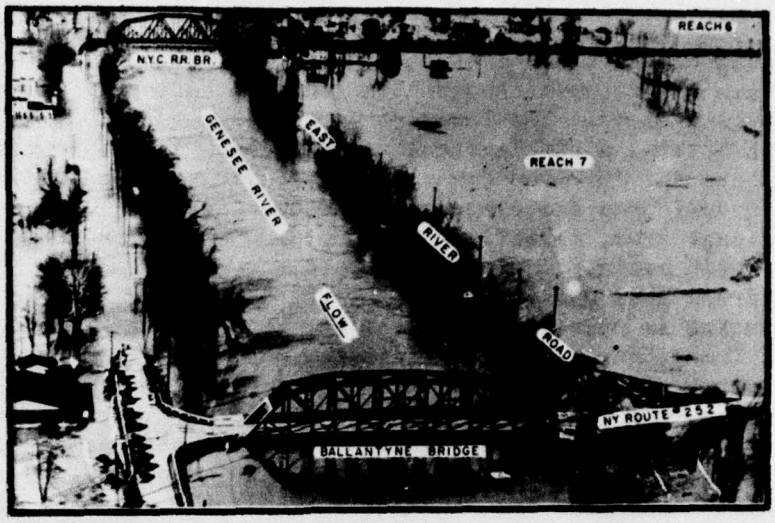


Photo No. 8 - Area South of Rochester, New York that was vulnerable to severe and frequent flooding before completion of Mount Morris Reservoir in November 1951. Photograph shows the flood of 2 April 1940. Red Creek area is on the right and Black Creek enters on the left. A flood of this magnitude would be an approximate 100-year event since the completion of Mount Morris. (Democrat and Chronicle Photo)

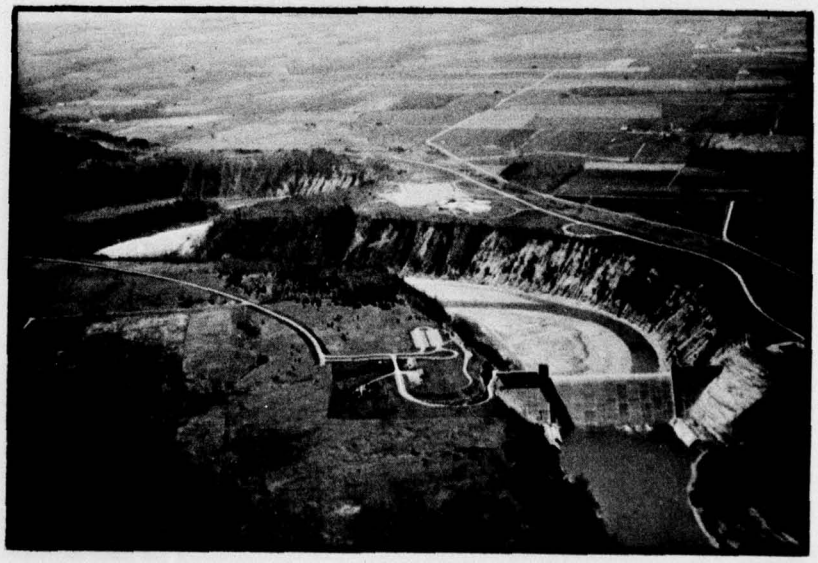


Photo No. 9 - Mount Morris single-purpose flood control dam and reservoir at the lower end of the "Portage Gorge". The tailwater pool in foreground is due to a small power dam approximately one and a half miles downstream. The "North End Recreation Complex", Letchworth State Park can be observed upstream of the dam on the left bank.

119. Flooding on the basin tributaries affects primarily agricultural lands and farm buildings although higher concentrations of damage are found in certain areas. The lower reaches of Canaseraga Creek, for example, constitutes a rich agricultural valley which is inundated almost annually, photo No. 10. Red Creek, in rapidly-developing suburbs near Rochester, experiences flooding both from the Genesee River and from its own drainage area. The right portion of photo No. 8 shows a part of the Red Creek basin. An interim report was submitted for flood control of the Red Creek area and authorized by the 89th Congress, 2nd Session. Advance planning is presently underway for the Red Creek project. Lower Black Creek, just south of Rochester experiences annual flooding. This area, photo No. 11, is still primarily agricultural lands, but may shortly develop into a suburb of Rochester. Oatka Creek is subject to flooding within the village of Warsaw. A project was completed in July 1968 to alleviate the condition. These locations and remaining reaches sustaining damage are included in table 13. Reaches are described in detail in Appendix "F," Flood Control.

TABLE 13 - Average annual flood damage

Main stem reach	Tributary reach	Avg. annual damage	Remarks
		$	
1. Rochester		5,000	(1)
2. Chili		-	
	Black Cr.	16,850	
	Red Cr.	26,300	(2)
3. Avon		5,750	
	Oatka Cr.	4,500	
	Oatka Cr. (Warsaw)	39,200	(3)
	Honeoye Cr.	3,000	
4. Geneseo		450	
	Conesus Lake	2,500	
	Keshequa Cr.	3,000	
	Canaseraga Cr.	64,650	(4)
5. Mt. Morris		-	(5)
6. Portageville		1,650	
	Wiscoy Cr.	3,000	
7. Fillmore		2,250	
8. Belfast		500	
	Angelica Cr.	7,800	
9. Belvidere		350	
	Van Campen Cr.	1,230	
10. Belmont		700	
11. Scio		5,300	
12. Wellsville		23,800	(6)
13. Stannards Cor.		2,400	
14. Shongo		2,450	
	Cryder Cr.	3,990	
15. Pennsylvania		-	(5)

(1) Left bank Genesee River only.
(2) Local protection project authorized 1966 - Senate Document No. 107, 89th Congress, 2nd Session.
(3) Construction local protection project initiated October 1966.
(4) Only existing flood damages are shown. Local protection project included in this report. Refer to Appendix "C," Project Designs and Cost Estimates for complete analysis.
(5) No significant damages.
(6) Modification existing project - Design Memorandum for Rectification of Deficiencies in Completed Local Protection Project Wellsville, N. Y., April 1966.

Photo No. 10 - Extensive agricultural flooding along Canaseraga Creek. This flooding occurs annually and remains for extended periods of time. View looking across the valley downstream of Dansville, New York.

Photo No. 11 - Spring flooding in the lower Black Creek area in the town of Chili, Monroe County, New York. This area is primarily agricultural at the present time, but due to proximity to Rochester could develop in a suburban area in the near future.

120. SURFACE WATER SUPPLY

Review of the four economic subareas defined in the economic base study established that the basic divisions would be convenient for water supply study purposes. Basic data and analysis of present and expected future municipal and industrial water supply demands are given in Appendix "H," Water Supply and Water Quality Management. Mineral industry requirements are included in Part IV, Appendix "D," Economic Base Study. Water supply for rural domestic, livestock, irrigation and other agricultural use is given in Appendix "J," Agricultural Studies.

121. Municipal and industrial demand except for the Rochester Metropolitan subarea which includes all of Monroe County, included only communities partially or wholly within the Genesee River watershed. Orleans and Wayne counties, predominantly agricultural and lying outside the watershed, were also omitted from consideration for municipal and industrial water. Population and water demand for 1965 and as estimated for future years 1980 and 2020 are shown in table 14 and are discussed in succeeding paragraphs.

122. About 95 percent of the population of the Rochester Metropolitan subarea, Monroe County, is served by public water supply systems and it is assumed that all will be so served by 1980. Since 1875, the city of Rochester has drawn from Canadice and Hemlock Lakes, located in the Central Plains subarea about 30 miles south of the city. Estimated dependable yield is 34 mgd. In 1954, a treatment plant of 36 mgd capacity went into operation using Lake Ontario water to supplement the Hemlock system in meeting average and peak demands for the city. Monroe County Water Authority, serving a small portion of the city and the rest of the county, began operation of a 32 mgd treatment plant at Lake Ontario in 1963. Plans are underway to increase capacity to 57 mgd and the ultimate capacity with existing intakes will be 100 mgd. The Authority is planning to construct another treatment plant on Lake Ontario near the eastern county boundary. Industrial water supply was about 90 percent self-supplied in 1965. A principal user, Rochester Gas and Electric Corporation, has an intake of 158 mgd capacity which takes cooling water from Lake Ontario. The subarea appears committed to Lake Ontario for water and the supply is adequate in quality as well as in quantity.

TABLE 14. Municipal and industrial water demand

Subarea	Basin population	Served by public water systems	Water demand MGD: Non Ind.	Ind.	Total
Year 1965					
Allegheny Plateau[1]	35,800	18,100	1.9	0.6	2.5
Central Plains[2]	90,500	45,700	5.2	6.0	11.2
Rochester-Metro[3]	638,300	603,400	65.2	202.9	268.1
TOTAL	764,600	667,200	72.3	209.5	281.8
Year 1980					
Allegheny Plateau	37,200	18,500	2.1	1.0	3.1
Central Plains	106,900	53,600	6.5	9.1	15.5
Rochester-Metro	799,700	799,700	89.4	237.6	327.0
TOTAL	943,700	871,800	98.0	247.7	345.6
Year 2020					
Allegheny Plateau	40,600	19,800	2.5	1.4	3.9
Central Plains	153,800	74,100	9.4	13.3	22.6
Rochester-Metro	1,369,000	1,369,000	171.0	319.6	490.6
TOTAL	1,563,400	1,462,900	182.9	334.3	517.1

(1) Watershed portions of Allegany, Steuben and Potter (Pennsylvania) Counties.
(2) Watershed portions of Genesee, Wyoming, Livingston and Ontario Counties.
(3) Monroe County.

123. The Central Plains subarea includes most of Livingston county, large portions of Genesee and Wyoming Counties, and a small part of Ontario County. Areas adjacent to Monroe County are increasingly affected by metropolitan Rochester and are becoming suburban in character. About 80 percent of the water supply for municipal use was obtained from surface water in 1960. As previously stated, Canadice and Hemlock Lakes have been used as a principal source for Rochester since 1875. Honeoye, Silver and Conesus Lakes also are in the subarea and although heavily developed for private cottage sites, have been classified for public water supply by the State of New York. Certain villages and hamlets have been supplied from Hemlock system supply lines and others are seeking to obtain services from this source. Surface water of good quality is available to meet foreseeable needs of the subarea, although institutional arrangements for redistribution from existing sources may be difficult to evolve.

124. The Allegheny Plateau subarea consisting of a major portion of Allegany county along with small areas of Steuben, Cattaraugus and Potter counties does not have its population centralized in any significant area. It is instead concentrated in small communities throughout the area. Wellsville, the largest incorporated community in the area is the only village that uses a surface water supply, the Genesee River.

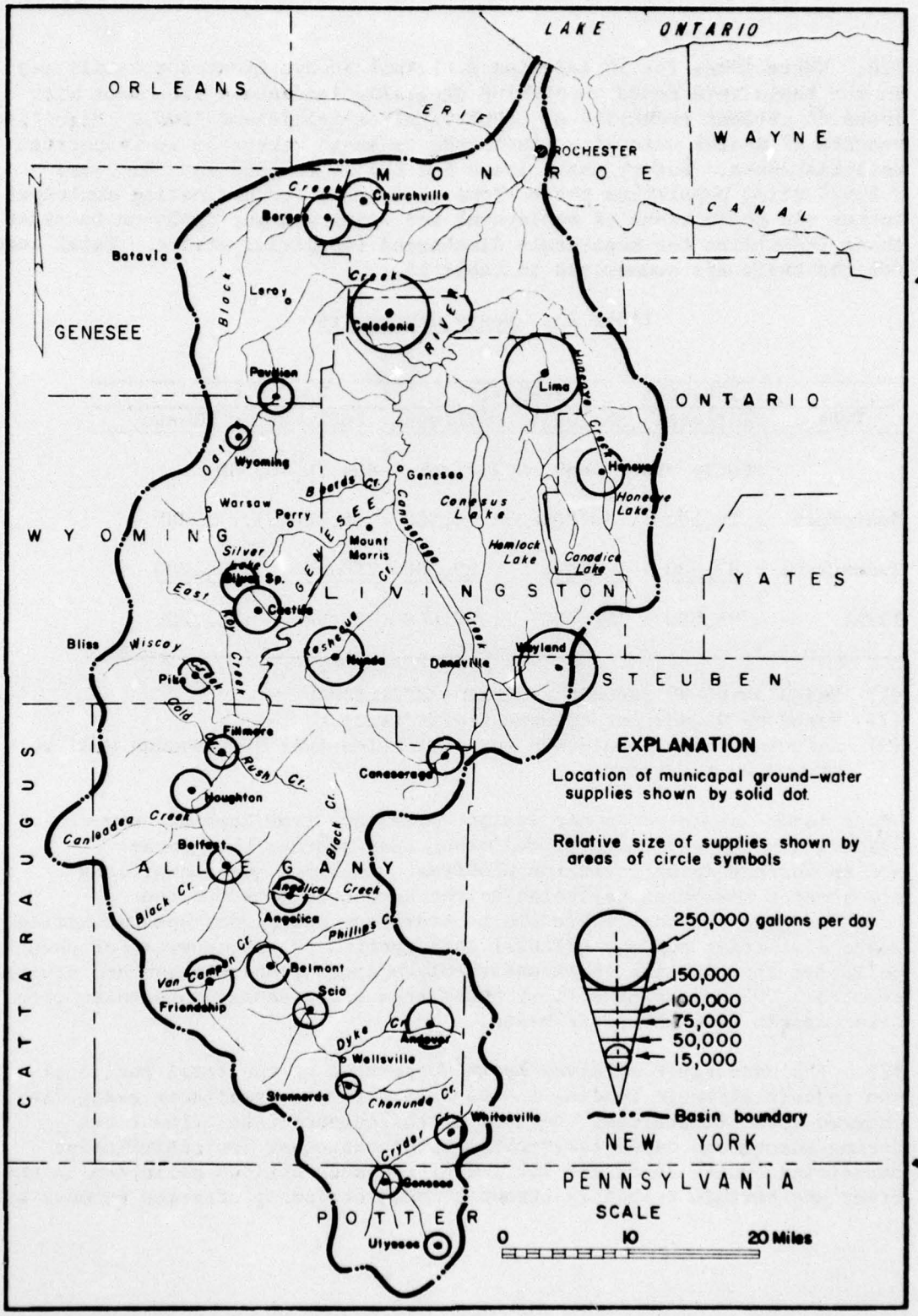
125. GROUNDWATER

Groundwater of good quality is readily available in the valleys of the river and larger tributaries throughout the central and southern sections of the basin. Withdrawals could be increased several times over present usage. The location and size of present municipal supplies are shown in figure 27.

126. The small communities characteristic of the entire Allegheny Plateau subarea draw almost exclusively on groundwater as the most economic and convenient source of water. Wellsville, as stated above, is the exception, but is considering development of groundwater sources. Groundwater for domestic use in the other subareas in 1965 were relatively small. The Central Plains used a total of about 1 mgd and the Rochester Metropolitan subarea totals about 0.1 mgd.

127. WATER QUALITY MANAGEMENT

An inventory of waste treatment facilities and a sampling program were undertaken in 1964 by a Federal-State task group to establish treatment levels and the consequent water quality characteristics of the basin's lakes, streams and groundwater resources. Findings are reported in Appendix "H," Water Supply and Water Quality Management; Appendix "I," Groundwater; and Appendix "J," Agricultural Studies which includes data on effects of agricultural pesticides.



MUNICIPAL WATER SUPPLIES FROM GROUNDWATER

FIGURE 27

128. Waste loads for 16 existing municipal sewage treatment facilities in the basin were found to provide generally inadequate treatment with about 45 percent reduction of biochemical oxygen demand (BOD). Significant amounts of wastes were also discharged to basin waters by 16 industrial establishments. Future waste loads for the years 1980 and 2020 were derived using population projections as a basis for estimating municipal wastes and projections of employment and water use per employee in water using industries for separately discharged industrial wastes. Total loads for the basin are summarized in table 15.

TABLE 15. Waste discharges

Type	1964-65: Effluent	1980 (1): Influent	1980 (1): Effluent	2020 (2): Influent	2020 (2): Effluent
	Daily waste load in lbs. of 5-day 20° C, BOD				
Municipal	14,500	30,000(3)	4,500	58,000(3)	5,800
Industrial	83,500	160,000	23,500	250,000	25,200
TOTAL	98,000	190,000	28,000	308,000	31,000

(1) Based on 85-90 percent treatment efficiency.
(2) Based on 90 percent treatment efficiency.
(3) Assuming total population in communities over 500 persons will be served by treatment.

Waste loads tabulated do not include overflows from combined sewer systems nor the agricultural and other land sources that presently add to surface water pollution problems. Combined sewer overflows are a major source of pollution in the Rochester Area but the city has reported that there are no overflows during dry weather periods. Waste discharges and agricultural land runoff are also sources of phosphate pollution contributing to excessive algae production in lakes and streams. About 322,000 pounds of soluble phosphates are discharged annually into Lake Ontario from the river basin.

129. The main river receives about 90 percent of the total municipal and industrial waste loading in the basin with the remainder being discharged into tributaries. Because of the characteristic low flows during summer and early fall months with consequent low assimilative capacities, waste loads are sufficient to cause serious pollution on the river and certain tributary streams. Most seriously affected reaches are

the lower Genesee River below the Gates-Chili-Ogden area and the river in Rochester immediately above the mouth. Two additional river reaches and 19 tributary reaches are seriously affected with present waste treatment levels. The locations of these critical stream reaches are shown on figure 28. Even with the assumption that treatment levels will have reached 85 to 90 percent efficiency by 1980, and 90 percent or better by 2020, the two river reaches and six of the tributary reaches will experience serious quality deficiencies. Data for these most critical reaches are shown in table 16.

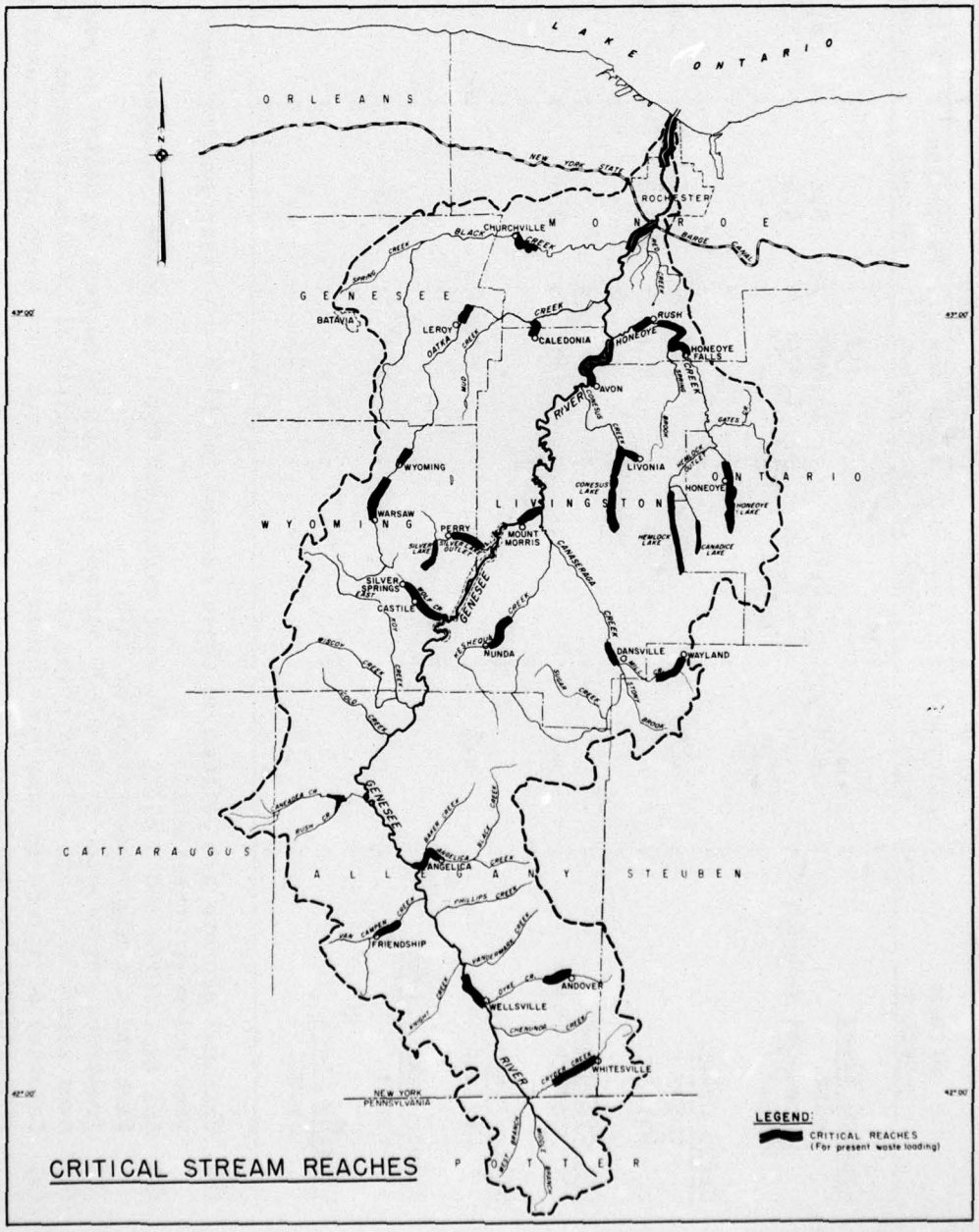


FIGURE 28

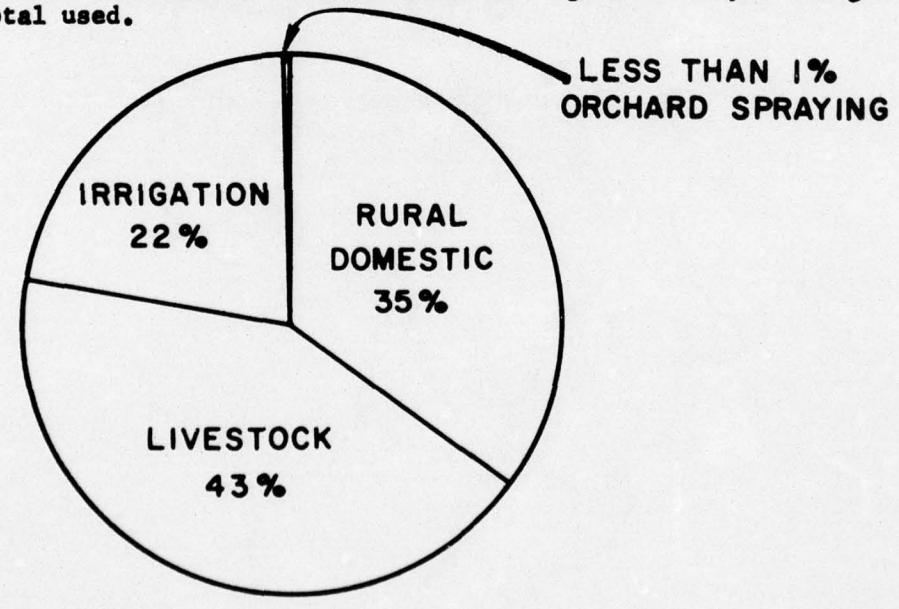
TABLE 16. Waste loads for critical reaches[1]

Stream Sector	Min DO allowable mg/l	Year 1980			Year 2020		
		5-day BOD capacity[2]	in lbs loading[3]	Projected DO mg/l	5-day BOD capacity[2]	in lbs loading[3]	Projected DO mg/l
Genesee River							
Kodak	4.0	6,100	16,600	0.6	6,400	18,000	0.9
Gates-Chili-Ogden	4.0	2,030	1,870	4.4	2,200	3,150	3.1
Avon[4]	-	-	-	-	-	-	-
Oatka Creek							
LeRoy	4.0	--[5]	145	---	----[5]	155	---
Warsaw	4.0	90	220	0.0	100	200	0.9
Honeoye Creek							
Honeoye Falls	4.0	35	90[6]	0.0	55	100[6]	0.0
Mill Creek							
Wayland	4.0	25	60	0.0	30	50	1.9
Silver Lake Outlet							
Perry	4.0	175	580[7]	0.0	200	580[7]	0.0
Wilkins Creek							
Livonia	4.0	15	35	1.2	15	40	2.5

(1) Critical sectors are defined as those sectors in which the water quality goals will be contravened even with secondary treatment.
(2) All capacities and project DO's were calculated for the minimum 7 consecutive day, 1-in-10-year low flow and the high temperature of 25°C.
(3) Treatment anticipated to be 85-90 percent in 1980; 90 percent or better in year 2020.
(4) Avon sector has been deleted owing to finds of additional studies subsequent to completion of Appendix "H."
(5) Capacity of stream in area downstream of LeRoy where flow reappears from underground passage - is three time anticipated loading.
(6) Loading calculated assuming reduced operations of Dutch Hollow Creamery.
(7) Based on assumption that Perry Knitting will experience normal growth.

130. RURAL WATER USE AND IRRIGATION

Agriculture in the Genesee region of New York State has experienced increasing specialization after a long period of general farming from the early years of the nineteenth century until about 1920. Dairy farming predominates the specialization which is being realized. While the rural farm population, number of farms and acreage harvested have continually declined, the rural non-farm population has increased and total rural population has remained relatively constant in most areas. Economic subareas of the basin, as established in the Economic Base Study, were not fully adaptable for agricultural analysis. Therefore, land resource areas as delineated by the Soil Conservation Service, were used, and are shown on figure 29. Land Resource Area 101, the Ontario Plain, includes that portion of the Genesee River watershed north of a generally east-west line through Mt. Morris Dam. The remainder of the watershed is in Land Resource Area 140, and is termed the Allegheny Plateau. It includes the economic subarea of the same name and the southernmost portion of the Central Plains subarea. Water requirements for livestock and irrigation are summarized by land resource areas and rural domestic supply is summarized by economic subareas. An additional subarea, termed the Lake Ontario Lake Plain Service Area, and lying along the Lake Ontario shore between Lockport and Rochester, was included in irrigation studies. The above agricultural water uses for the Genesee River basin and Service Area are shown in figure 30 as percentages of the total used.



DISTRIBUTION OF AGRICULTURAL WATER USE -1959 & 1960

FIGURE 30

AD-A041 702 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 8/6
GENESEE RIVER BASIN STUDY. STUDY OF WATER AND RELATED LAND RESO--ETC(U)
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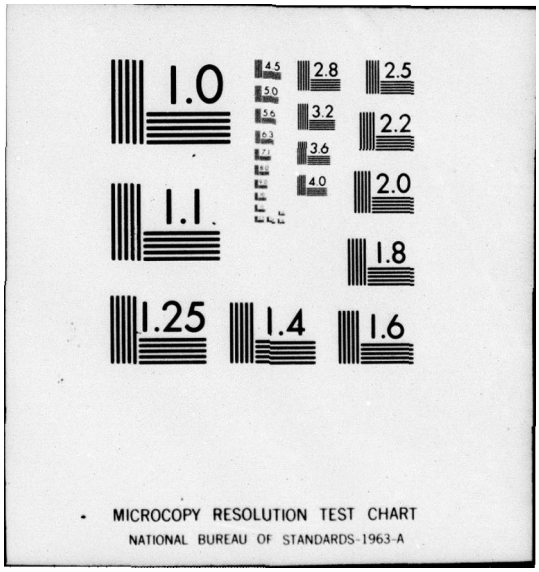
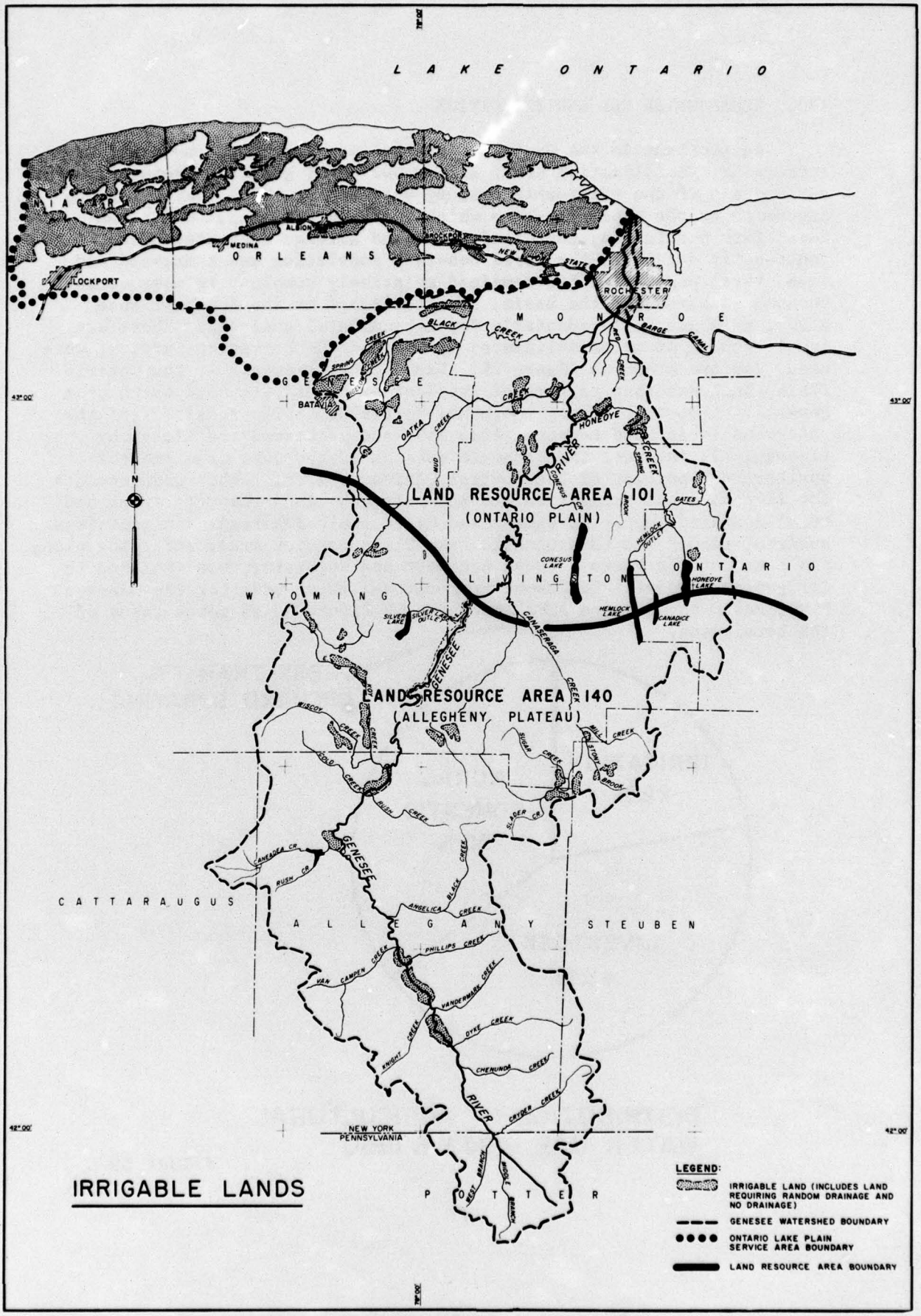

1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A


LAKE ONTARIO
NIAGARA
ORLEANS
MONROE
GENESEE
WYOMING
LIVINGSTON
ONTARIO
CATTARAUGUS
ALLEGANY
STEUBEN
YATES
LOCKPORT
MEDINA
ALBION
ROCHESTER
BATAVIA
NEW YORK
PENNSYLVANIA
LAND RESOURCE AREA 101
(ONTARIO PLAIN)
LAND RESOURCE AREA 140
(ALLEGHENY PLATEAU)
GENESEE RIVER
BLACK CREEK
BARGE CANAL
HONEOYE CREEK
CONESUS LAKE
HEMLOCK LAKE
CANADICE LAKE
CANASERAGA CREEK
SILVER LAKE
OATKA CREEK
MUD CREEK
SPRING CREEK
GATES
HONEOYE LAKE
WISCOY CREEK
GOLD CREEK
BUSH CREEK
SUGAR CREEK
MILL CREEK
STONY BROOK
SLADER CR.
CANEADEA CR.
BUSH CR.
ANGELICA CREEK
BLACK CREEK
PHILLIPS CREEK
VAN CAMPEN CREEK
VANDERMARK CREEK
DYKE CREEK
KNIGHT CREEK
CHENUNDA CREEK
CRYDER CREEK
WEST BRANCH
MIDDLE BRANCH
POTTER
43° 00'
42° 00'
IRRIGABLE LANDS
LEGEND:
IRRIGABLE LAND (INCLUDES LAND REQUIRING RANDOM DRAINAGE AND NO DRAINAGE)
GENESEE WATERSHED BOUNDARY
ONTARIO LAKE PLAIN SERVICE AREA BOUNDARY
LAND RESOURCE AREA BOUNDARY

131. By agreement among participating agencies, rural domestic water users in Monroe County were included in the municipal and industrial water survey. Orleans and Cattaraugus Counties were omitted from rural domestic water supply inventories because of the small number of users involved. The rural population in the Genesee River watershed dependent upon individually-owned wells, springs or ponds and the water use in 1960 are given in table 17 together with estimated future population and demand.

TABLE 17 Rural domestic water demand

Subarea	1960		1980		2020	
	Population served	Annual demand million gallons	Population served	Annual demand million gallons	Population served	Annual demand million gallons
Central Plains						
Genesee	9,760	164	14,000	349	24,200	1,203
Livingston	19,130	321	23,000	561	29,000	1,457
Ontario	3,750	60	6,200	154	15,000	730
Wyoming	7,120	120	7,600	188	8,500	422
TOTAL	39,760	665	50,800	1,252	76,700	3,812
Allegheny Plateau						
Allegany	15,590	262	15,800	392	17,600	873
Steuben	1,970	33	2,000	50	2,000	100
Potter (Pa.)	1,450	24	5,700	142	7,600	377
TOTAL	19,010	319	23,500	584	27,200	1,350

Local water sources are believed fully capable of meeting basin demands for rural domestic water supply. Individual well systems have proved unsatisfactory in certain localities such as Perry in Wyoming County, but organized water supply systems to develop available supplies would be sufficient to meet demands for such areas.

132. Livestock water requirements: Water used for livestock was most recently estimated for the entire basin for the year 1959 when about 1,165 million gallons were required. Projected demands for the two land resource areas of the basin are shown for two future years in table 18.

TABLE 18 - Livestock water demand

Land resource area	1959	1980	2020
	Annual demand in millions of gallons		
Ontario Plain	-	724	1,508
Allegheny Plateau	-	693	1,113
TOTAL	1,165	1,417	2,621

Future water needs for livestock are believed capable of being met by local sources.

133. Irrigation water for the basin: Large scale supplemental irrigation of farm lands to improve quality of products and to increase yields is relatively new in New York State but accelerated in the two decades after 1940. Except for Allegany and Steuben Counties in New York and Potter County in Pennsylvania, this growth has been characteristic of the Genesee region with Monroe, Genesee and Livingston Counties leading in terms of acres irrigated. Because of urbanization, farm lands in Monroe County are decreasing and the rate of growth in irrigation has become slower than in the other two leading counties. Within the river basin, about 49,600 acres of farm land, generally located in small, scattered areas in northern subwatersheds are believed irrigable after provision of relatively minor drainage works. Figure 29 shows those areas in the basin and in Ontario Lake Plains Service area considered to be irrigable land. In 1964, about 5,200 acres were irrigated and the major source of water was natural stream flow. Estimated future annual water requirements for each of the basin's two land resource areas are summarized in table 19. A deficit is shown for each period based on the assumption that acreage irrigated in 1964 represents the maximum that can be served adequately from existing sources.

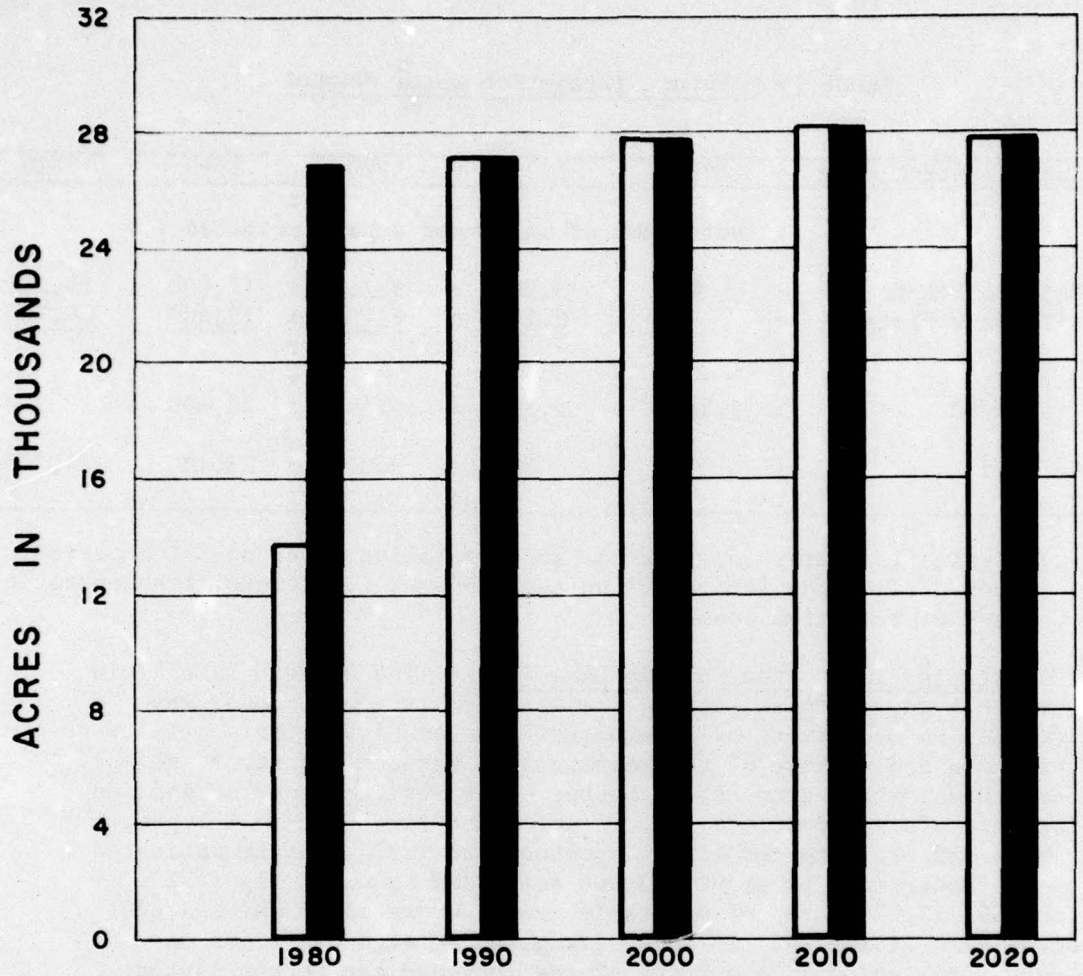
TABLE 19 - Future irrigation water demand

Land resource area	1964	1970	1980	1990	2020
	acre-feet of water and acres irrigated (1)				
Ontario Plain	-	3,700	9,100	17,800	19,200
Allegheny Plateau	-	2,100	5,400	10,800	10,700
Total required	5,200	5,800	14,500	28,600	29,900
Deficit	0	600	9,300	23,400	24,700

(1) Irrigation water for potatoes and vegetables based on 1/2 acre-foot per acre on the land, plus an equal amount in storage, transportation and distribution losses.

134. Irrigation on the Ontario Lake Plain: The Ontario Lake Plain Service Area, although outside the Genesee River watershed, was included in Department of Agriculture studies because of proximity to the basin and because of the relationship between the river and the Barge Canal which cross at Rochester. The Service Area, as defined for this study, comprises 482,000 acres and land with soil types, slopes and drainage conditions adaptable to irrigation is estimated by the Department at about 183,000 acres and shown on figure 29. In 1959, 23,000 acres of vegetables were harvested of which 3,820 acres were irrigated. In 1964, irrigated acreage had risen to 5,450 acres and only a portion of the increase can be attributed to generally low rainfall in the period. Crops irrigated are primarily the major truck crops for which there is heavy demand and no national surplus. The Lake Plain is also noted for fruit production but the value of irrigating deep-rooted crops has not been established and was not further considered.

135. Although growth has been rapid, acreage irrigated is a small percentage of total irrigable land, possibly due to the following factors: lack of sufficient quantities of water or uncertainty of future supplies, uncertainties as to technology or possible benefits, lack of capital and management skill, scarcity of labor, and institutional restrictions related to riparian or other water rights. These factors would also be relevant to other potentially irrigable land in the basin. Figure 31 is a summary of projected irrigation water requirements on the Lake Plain based on expected acreages of potatoes and vegetables, and assuming satisfactory resolution of deterrent factors. Deficits shown assume that 1964 acreage irrigated is about all that could be served from existing sources of supply.



PROJECTED IRRIGATION WATER NEEDS ONTARIO LAKE PLAIN SERVICE AREA (1)

LEGEND

ACRES IN VEGETABLES

ACRES TO BE IRRIGATED

YEAR	1980	1990	2000	2010	2020
CURRENT DEFICIENT IN ACRE FEET OF WATER (2)	7,910	21,600	22,210	22,730	22,220

(1) ONE ACRE-FOOT STORED FOR EACH ACRE IRRIGATED.

(2) DEFICIT BEYOND CURRENT IRRIGATION WATER AVAILABLE AND USED. (5450 A-F)

FIGURE 31

136. SOIL CONSERVATION AND LAND MANAGEMENT

Resource needs for rural areas of the basin were studied by the Department of Agriculture and are presented in Appendix "J," Agricultural Studies. The Department cooperated in all task groups, and findings within the scope of appendices other than that on agriculture are included in the appropriate paragraphs on water supply, flood control, etc. Needs not discussed previously are major drainage and land treatment measures.

137. About 108,000 acres of land in the basin could be benefited by drainage works. Small on-farm parcels are considered below under land treatment. Large areas which are also subject to flooding are found in the Canaseraga Valley below Dansville where 11,500 acres are used for nursery stock, specialty vegetables and field crops; Oatka Creek below Warsaw where 2,000 acres could be made more productive by drainage; and Black Creek (Monroe County) in the town of Chili where rapid urbanization would certainly replace present farm usage if the dominant flood problem could be corrected and adequate drainage be provided.

138. Projections of land use for the river basin indicate that, in the period from 1970 to 2020, cropland acreage will decline by about 21 percent; pasture lands will decline by about 22 percent; forest lands will increase by about 21 percent; lands in urban use will increase by some 35 percent. The changing pattern of land use will require land treatment measures to reduce erosion, eliminate excessive water conditions, improve unfavorable soil conditions and protect forest lands. Recommended measures such as contour cultivation, strip cropping, diversion terraces, drainage, and establishment and improvement of ground cover vegetation are considered further in Appendix "J." Total basin acreages in cropland, pasture and forests in 1966 and acreages requiring land treatment are shown in table 20.

TABLE 20 - Land treatment needs

County	Cropland		Pasture		Forest	
	Total acres	Acres needing treatment	Total acres	Acres needing treatment	Total acres	Acres needing treatment
Allegany	124,610	51,600	79,300	36,460	185,000	140,900
Cattaraugus	1,600	950	1,000	1.100	5,820	3,900
Genesee	64,810	36,960	22,300	8,350	21,380	9,700
Livingston	213,310	90,350	69,800	60,200	75,180	45,100
Monroe	61,810	40,760	10,200	9,590	15,800	8,900
Ontario	26,400	13,890	13,800	16,200	29,710	14,700
Orleans	600	300	250	40	370	-
Steuben	24,780	19,280	7,200	2,810	16,530	13,300
Wyoming	96,200	51,440	26,570	12,180	50,300	25,000
Potter (Pa.)	13,000	6,950	9,400	6,990	27,500	9,300
BASIN TOTALS	627,120	312,480	239,820	153,920	427,590	270,800

139. SEDIMENT AND EROSION

Stream samples, field reconnaissance, aerial photographs and map studies were employed to define areas subject to excessive sheet and bank erosion and to provide data for reservoir sedimentation studies. Details are given in Appendix "K," Sedimentation. The lower Genesee River delivers a heavy sediment load to Lake Ontario during high runoff periods and dredging by the Corps of Engineers to maintain navigation in Rochester Harbor involves removal of about 82,000 tons annually. This condition can be observed in photo No. 12. Representative average annual sediment discharges at other locations on the basin are given in table 21.

TABLE 21 - Sediment discharges at selected points

Station	Drainage area sq. mi.	Number of measurements	Average annual sediment discharge tons/sq. mi./year
Genesee River at Scio, N. Y.	309	17	200
Genesee River at Portageville, N. Y.	982	22	600
Canaseraga Creek near Dansville, N. Y.	153	18	1,100
Genesee River at Avon, N. Y.	1,666	34	750
Oatka Creek at Warsaw, N. Y.	42	19	700
Oatka Creek at Garbutt, N. Y.	208	21	75

140. No critical areas of sheet erosion were found along the main stem of the river and the major source of sediment is from erosion of stream banks. In upland areas, sheet erosion is estimated to be about equal to channel erosion as a source of sediment, and while the basin as a whole is not severely affected by sheet or gully erosion, significant benefits could be realized by land treatment measures on abandoned farmlands reverting to forest, and by improved management of established forest lands. Stream bank erosion causes locally severe losses of

cropland, roads and buildings but need for a major bank stabilization program is not indicated. Photograph No. 13 shows the Genesee River as it meanders through the rich farmland of the lower basin causing erosion of the channel banks. The most serious bank erosion problems are near the villages Belfast, Houghton, Fillmore and Scio, all in New York State. Photograph No. 14 shows the problem near Belfast.

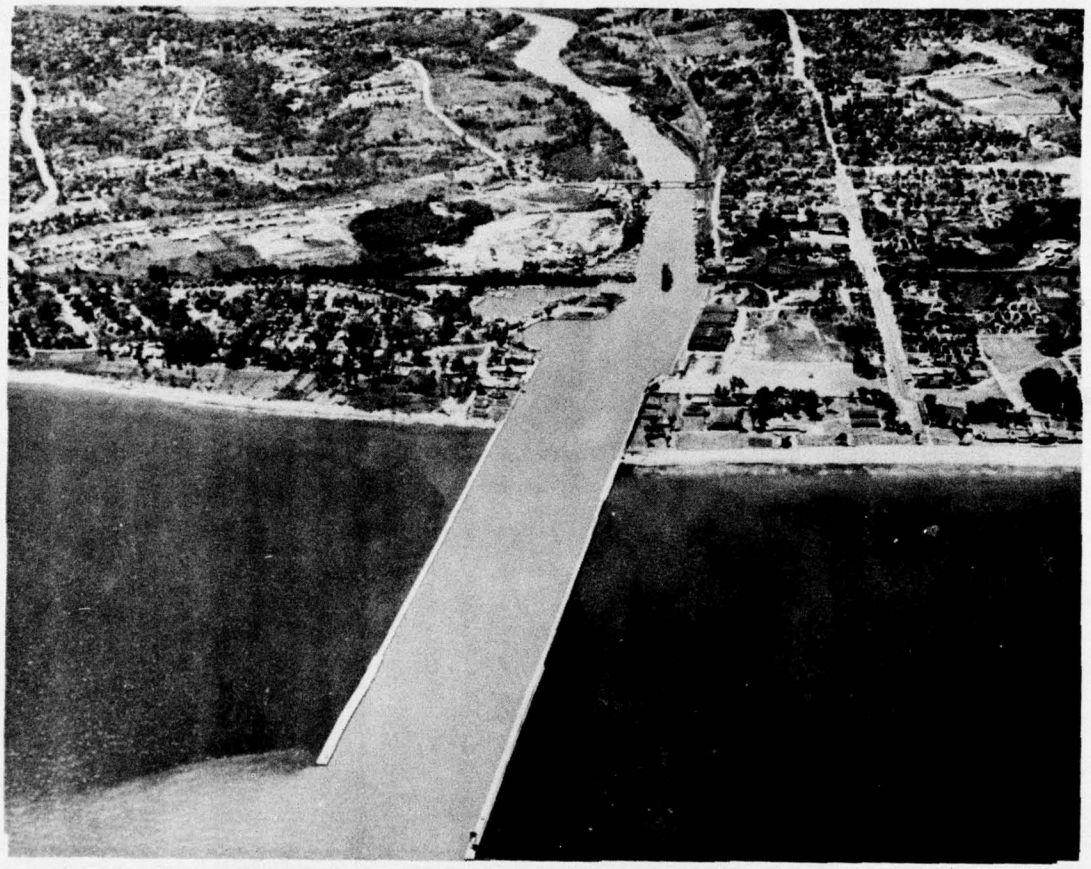


Photo No. 12 - Aerial view of Rochester Harbor, Rochester, N. Y. The Genesee River empties into Lake Ontario carrying a distinctive burden of sediment. The U.S. Corps of Engineers dredges about 50 acre-feet of deposited material each year to maintain navigation in the harbor.

Photo No. 13 - The Genesee River meanders through the rich farmland of the Lower Basin. The many sharp and/or horseshoe bends cause severe bank erosion on the outside of the bends

Photo No. 14 - Bank erosion on an outside river bend along New York route #19, just south of the village of Belfast which is seriously endangering a house and barn. The state of New York is planning bank stabilization work in this area to protect route #19. Photo was taken in May 1966.

141. OUTDOOR RECREATION

The task of evaluating existing and potential outdoor recreation in the Genesee River basin required, as an initial step, determination of the area which would contribute significant numbers of users and offers alternative opportunities for recreational use and development. Determining factors were origin-destination data for visitors to state parks in western New York, travel time and distance from major population centers in western and west-central New York, and the distribution of public recreation areas in the same portions of New York and in certain contiguous counties of Northwestern Pennsylvania. The influence area so defined consisted of the subareas of the economic base study with additional counties as shown on figure 4 and in table 22. It is noted that any point in the river basin can be reached within 2 hours driving time from population centers in the influence area. The 1960 and estimated future populations for the recreation subareas are shown graphically on figure 32. Additional data concerning outdoor recreation can be found in Appendix "M."

TABLE 22 - Recreation subareas

Subarea			
Metropolitan	Barge Canal	Central Plains	Allegheny Plateau
Counties comprising subareas			
Erie (1)	Orleans	Genesee	Allegany
Monroe	Wayne	Livingston	McKean (Pa.)(1)
Niagara (1)		Ontario	Cattaraugus
		Wyoming	Potter (Pa.)
		Yates(1)	Chautauqua (1)
			Tioga (Pa.)(1)
			Steuben
			Warren (Pa.)(1)

(1) Counties not included in economic subareas.

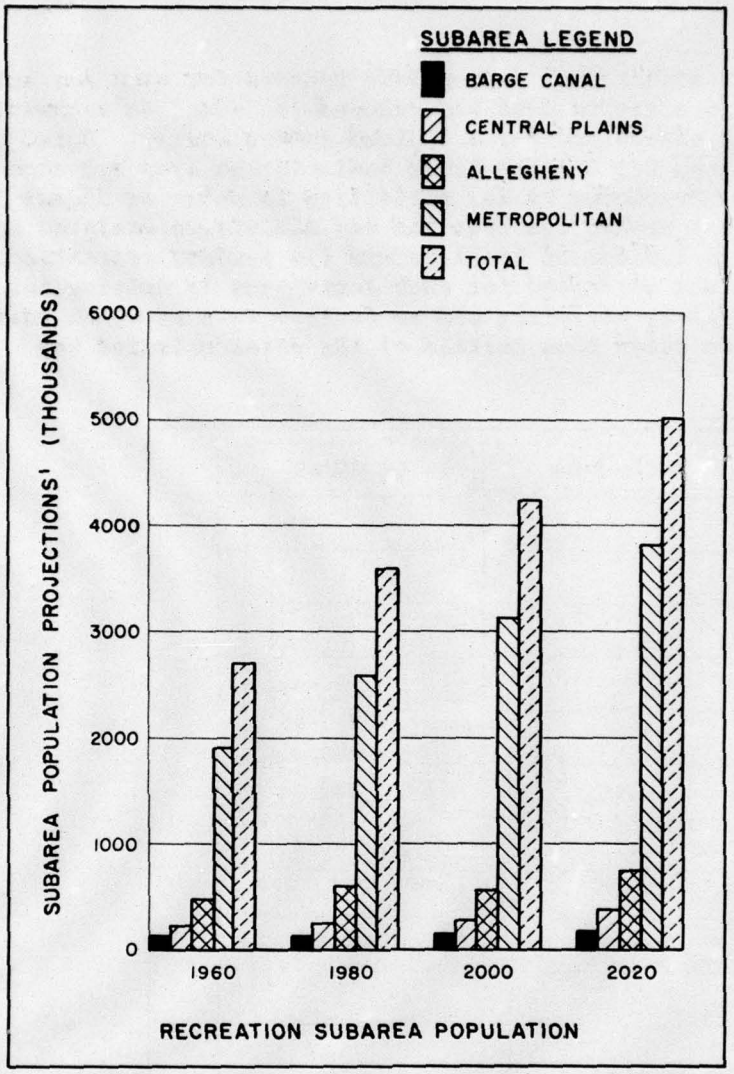
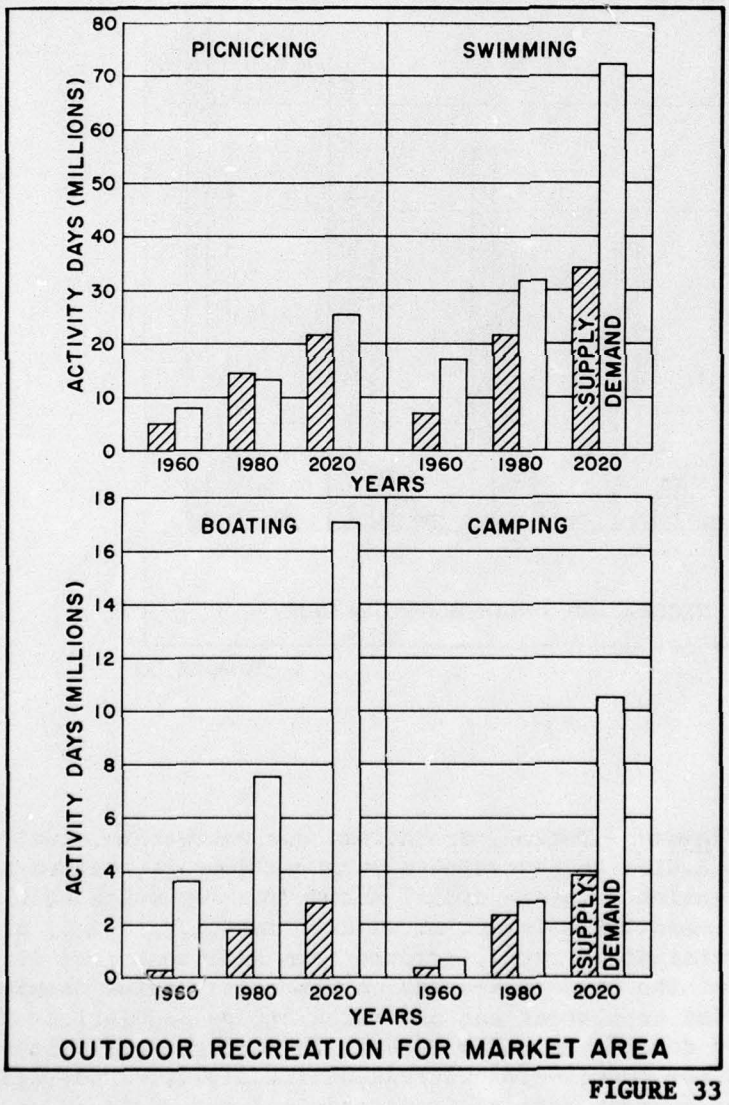


FIGURE 32

142. Market area demand: Demand, as defined for recreation studies, is an individual's desire to participate in an outdoor recreation activity. The four key water-oriented recreational activities for which total market area demands were quantitatively estimated are boating, camping, picnicking and swimming. Participation rates, adapted from data contained in Study Reports 19 and 26 of the Outdoor Recreation Resources Review Commission (ORRRC), were applied to current and estimated future populations to obtain estimates of demand, in activity days, by market area residents. Allowance was made for out-of-area recreational activity. Non-resident demand was based on current ratios of resident and non-resident attendance

at area state parks adjusted by appropriate factors for each key activity. Total area demand in activity days was reduced to demand in recreation days for the summer season and for a typical summer Sunday. Total demand in recreation days for the Genesee River basin market area are shown in table 23 below. Breakdown by key activities is shown on figure 33. The task group report emphasizes that the key activities analyzed are intended to serve as indices of total demand for outdoor recreation. Quantification was not attempted for such activities as driving for pleasure, outdoor games, bicycling and so forth - some of which have higher participation rates than certain of the water-oriented key activities.



OUTDOOR RECREATION FOR MARKET AREA

FIGURE 33

143. Supply: Recreation resource supply was based primarily on an inventory of existing and programmed developments in terms of capacity to accommodate the four key activities. The inventory included supply from the private sector as well as publicly-administered lands and facilities. Photograph 15 shows a portion of the available private sector. Photograph 16 and 17 shows the public recreation complex available at Letchworth State Park. In projecting future supply, it was assumed that all existing and programmed public developments represented 1980 supply. Current private sector supply was assumed to be at least that to be available in 1980. For each of the periods to 2000 and to 2020, an increase of 25 percent was assumed for available supply. Ability of the total market area supply to satisfy activity days of demand for the four key activities was converted to recreation days and is shown with demand in table 23. Figure 34 shows the location of State Parks in the Basin and figure 5, Part II, Appendix "M," shows all recreation facilities in the market area.

Photo No. 15 - An example of the facilities of the private recreation sector, the waterfront of a children's camp on Conesus Lake.

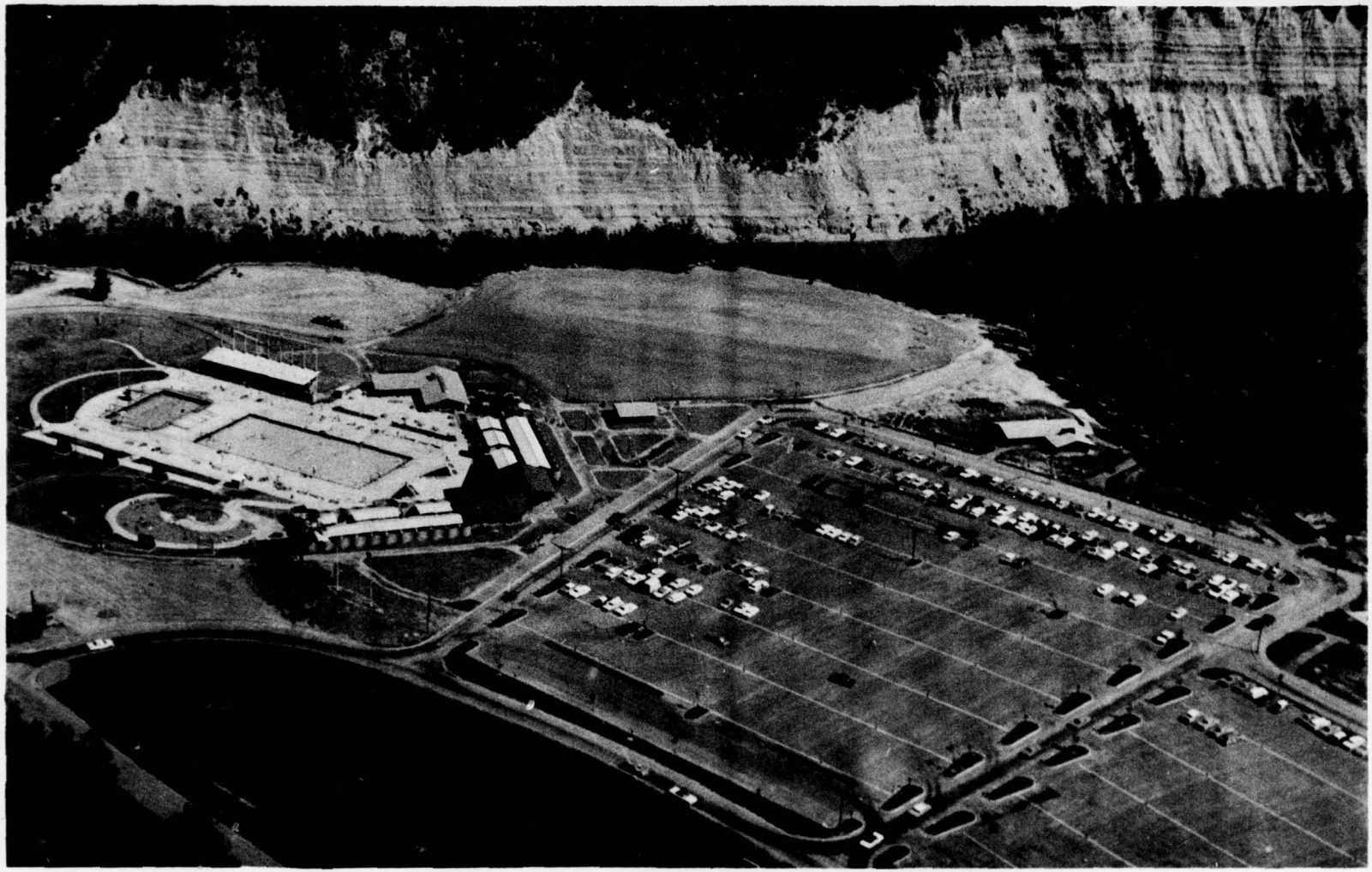


Photo No. 16 - Public recreation facility, "North End Recreation Complex", Letchworth State Park, includes swimming area, picnicking area with 450 tables and three shelters and parking for 1200 cars. (Photo courtesy Genesee State Park Commission)

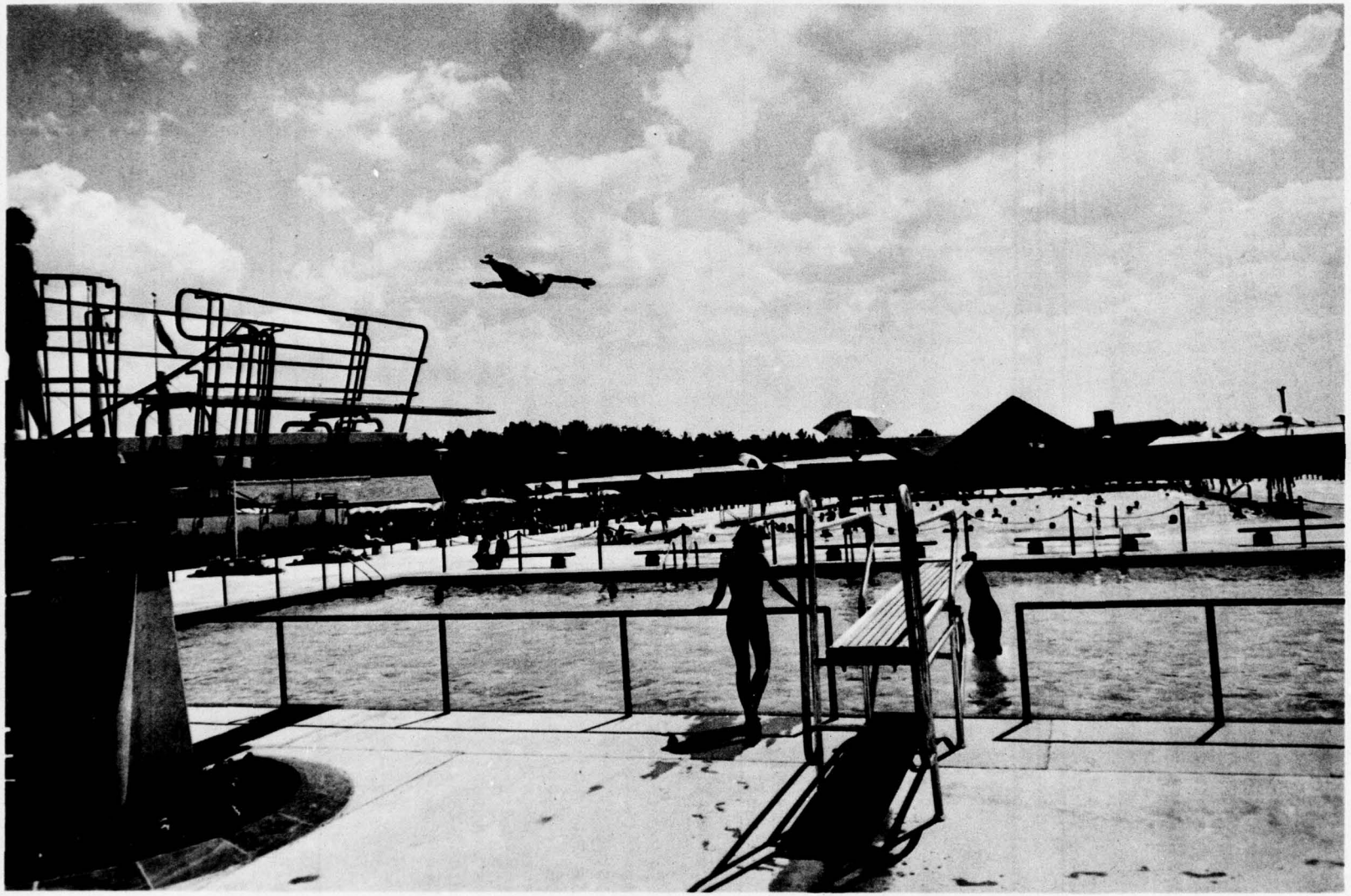


Photo No. 17 - Close-up of diving pool and swimming pool at the "North End Recreation Complex". Instant capacity of pools is 2,000 swimmers. (Photo courtesy Genesee State Park Commission)

144. Needs: Despite extensive areas of attractive and relatively undeveloped countryside, abundant rainfall, and substantial acreages of water surface in lakes within or continguous to the market area, the opportunity for water-oriented general recreation falls far short of existing and estimated future demand. The differences in supply and demand by activity days for the four key activities were converted to recreation days and are shown in table 23.

TABLE 23 - Market area demand, supply, and needs

Year	Summer season			Typical summer Sunday		
	Demand	Supply	Needs	Demand	Supply	Needs
	1,000 recreation days (1)					
1960	21,700	8,600	13,100	610	170	440
1980	40,250	26,300	13,950	1,230	630	600
2000	65,350	32,950	32,400	1,960	640	1,320
2020	91,650	41,160	50,490	2,720	630	2,090

(1) Rounded from figures in appendix "M."

145. Resource requirements in terms of acres of land and water surface to meet estimated future needs were based on the four key activities for a typical summer Sunday. Additional allowances were made to provide opportunity for activities other than the four investigated in detail. Lands actually developed for specific uses in a management unit such as a park or recreation unit represent only a portion of the total land requirements for the unit. For 1980 requirements in the Genesee basin area of influence, the factor used was about 40 percent. Estimated total land and water surface acreages required in the market area are shown in table 24.

TABLE 24 - Resource requirements, recreation market area (1)

(Acres)

Subarea	1980		2000		2020	
	Land	Water	Land	Water	Land	Water
Metropolitan Area	10,800	68,000	66,500	121,800	168,800	171,100
Barge Canal	6,700	600	15,600	3,500	6,400	5,700
Central Plains	6,900	6,400	15,000	10,300	7,300	16,200
Allegheny Plateau	7,300	14,400	20,200	25,300	24,000	32,400
MARKET AREA TOTAL	31,700	89,400	117,300	160,900	206,500	225,400

(1) Requirements for a typical summer Sunday.

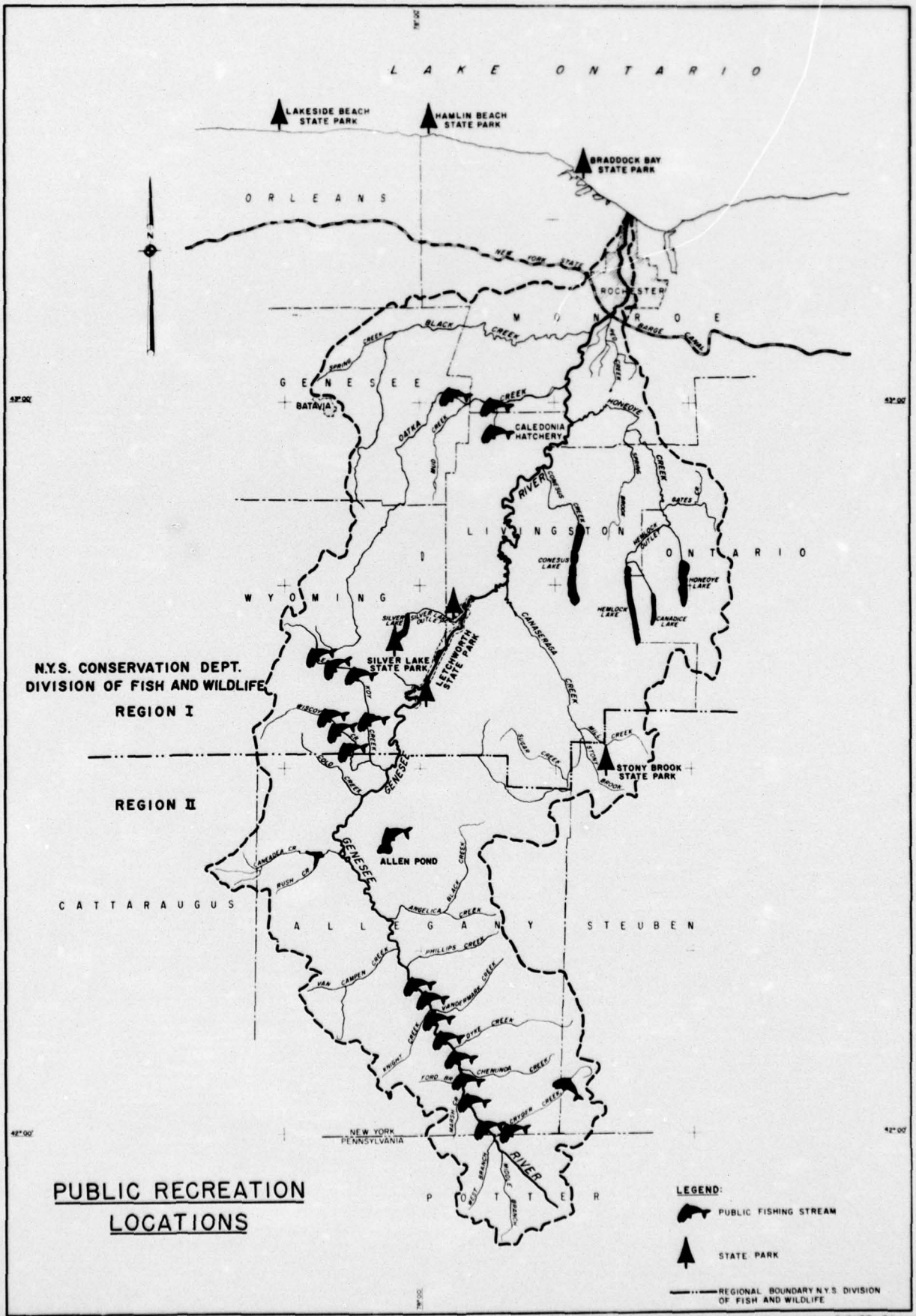

LAKE ONTARIO
LAKESIDE BEACH STATE PARK
HAMLIN BEACH STATE PARK
BRADDOCK BAY STATE PARK
ORLEANS
MONROE
ROCHESTER
GENESEE
BATAVIA
CALEDONIA HATCHERY
LIVINGSTON
ONTARIO
WYOMING
SILVER LAKE STATE PARK
LETCHWORTH STATE PARK
STONY BROOK STATE PARK
ALLEN POND
CATTARAUGUS
ALLEGANY
STEUBEN
PHILLIPS CREEK
VANDERMARK CREEK
DYKE CREEK
CHENUNDA CREEK
SNYDER CREEK
NEW YORK
PENNSYLVANIA
POTTER
N.Y.S. CONSERVATION DEPT.
DIVISION OF FISH AND WILDLIFE
REGION I
REGION II
PUBLIC RECREATION LOCATIONS
LEGEND:
PUBLIC FISHING STREAM
STATE PARK
REGIONAL BOUNDARY N.Y.S. DIVISION OF FISH AND WILDLIFE

FIGURE 34

146. FISH AND WILDLIFE MANAGEMENT

Field surveys, intended primarily to obtain data on actual fishing and hunting use made of the river basin's lands and waters, also disclosed that about 50 percent of the users came from the Buffalo Metropolitan area in 1964. For this reason, the influence area for fish and wildlife studies added Erie and Niagara Counties to the 11 counties included in the economic base study. The area of influence is shown on figure 4. Total population and population 12 years of age and older in the influence area for 1960, and as estimated for two future dates, are shown on figure 35. Appendix "N," Fish and Wildlife contains additional data.

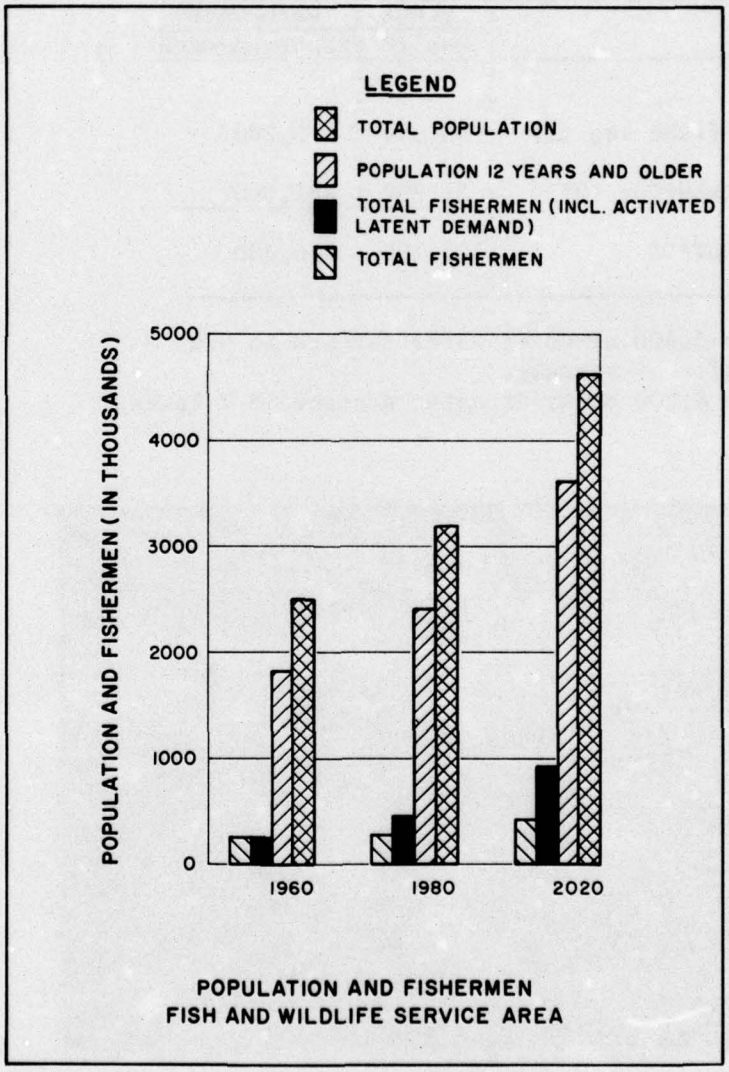


FIGURE 35

147. Demand and Supply: Present and projected estimates of number of fishermen and participation rates were based on service area population, field surveys of fishing and hunting. Field data collected in 1964 showed that, of the 215,000 active fishermen in the service area, 80,000 fished in Genesee River basin waters for a total of about 362,000 man-days of use distributed by types of fishing as shown in table 25. Figure 34 shows the location of the several public fishing streams in the basin and photograph 18 shows a check dam on one of the public trout streams.

TABLE 25 - Basin fisherman-days, 1964

	Trout	Warm-water
	Use in fisherman-days	
Stream fisheries (1)	53,300	5,200
Lake fisheries (2)	51,800	251,600
BASIN TOTALS	105,100	256,800

(1) On 5,400 acres of water surface in 570 miles of streams.
(2) On 8,800 acres of water surface in 7 lakes.

Photo No. 18 - A check dam on lower Oatka Creek to enhance the trout fishing. This reach of Oatka is a public fishing stream administrated by the Conservation Department, State of New York.

The basin total represented nearly 5 days annually in the basin for each user or about one-quarter of total fishing activity by the 80,000 fishermen. If quality and quantity of fishing opportunity were to be sufficiently improved, users from metropolitan Buffalo would be expected to spend at least 10 days annually, and users from most of the rest of the service area at least 18 days annually in the basin. In addition, other persons in the area not presently fishing in the basin would be attracted to improved fisheries. This latent demand, estimated at 40,000 persons in 1960, would increase to about 90,000 persons in the year 2020. Estimates of fishing demand based on present participation rates and projected population growth, and estimates of total potential demand including gradual conversion of latent demand to active participation by straight line growth to the year 2020 are shown in table 26.

TABLE 26 - Service area and basin fishing demand

	Actual:	Projected	
	1960	1980	2020
Service area	Numbers of fishermen		
Total fishermen (1)	215,000	275,000	400,000
Latent demand	240,000	330,000	500,000
Latent convertible to active demand(2)	0	165,000	500,000
Total, incl. activated latent demand	215,000	440,000	900,000
Fishing in Genesee River basin			
Total fishermen (1)	80,000	106,000	160,000
Latent demand	40,000	58,000	90,000
Latent convertible to active demand(2)	0	30,000	90,000
Total, incl. activated latent demand	80,000	136,000	250,000
	Use in fishermen days		
Annual use without latent demand(1)	362,000	490,000	740,000
Annual use with latent demand (2)	0	2,060,000	3,900,000

(1) Based on 1960 participation rates and future population growth.
(2) Assuming improved fishing opportunity and revised in accordance with data from Appendix "N," Fish & Wildlife, dated May 1969.

In 1960, 570 miles of stream provided 5,400 acres of water surface and seven lakes provided 8,800 acres for a total of 14,200 acres of water surface in the basin. In that year, the basin fisheries afforded 362,000 fisherman-days of use. The 1960 acreage could constitute a supply capable of supporting 715,000 fisherman-days by 1980 and 1,300,000 fisherman-days by the year 2020 provided improved public access is made available to existing waters and increased fishery productivity is obtained through correction of low flow, pollution and insufficient fish habitat problems.

148. Need: Future increase in fishing demand can be met by increasing productivity and improving access to existing waters, and by creating additional impoundments. Pressure on the basins fisheries can be expected to increase through population growth alone, and an index of requirements would be fisherman-days per acre of water surface. To maintain the 1960 ratio of 26 fisherman-days per acre and assuming no activation of latent demand, the present 14,200 acres of surface would need to be increased to 18,800 acres by 1980 and to 28,400 acres by 2020. If basin waters could be brought to full productive capability, additional acreage requirements to accommodate total demand, including latent demand that would consequently be activated, would be 27,000 acres by 1980 and, through higher productivity, 24,800 acres in 2020. Data is summarized in table 27.

TABLE 27 - Basin fishery requirements

	Actual	Projected	
	1960	1980	2020
Existing basin supply (acres of surface water)	14,200	14,200	14,200
Maximum capability of exist. fisheries (1)			
Use in fisherman-days	362,000	715,000	1,300,000
Fisherman-days per acre (exist. acreage)	26	50	100
Use, excluding latent demand (2):			
Number of fishermen	80,000	106,000	160,000
Use in fisherman-days	362,000	490,000	740,000
Fisherman-days per acre (exist. acreage)	26	34	52
Acres required at 1960 capability	14,200	18,800	28,400
Deficit in surface acres (3)	-	4,600	14,200
Use, including activated latent demand (1)			
Number of fishermen	80,000	136,000	250,000
Use in fisherman-days	362,000	2,060,000	3,900,000
Acres required at 1980 and 2020 capabilities	-	41,200	39,000
Deficit in surface acres (4)	-	27,000	24,800

(1) Assuming improved access and increased productivity.
(2) Based on 1960 participation rates and future population growth.
(3) With added fisheries having same average capability as 1960 waters.
(4) With added fisheries having 1980 and 2020 capabilities, respectively.

TABLE 27

149. Wildlife demand and supply: The total number of hunters in the service area was about 160,000 in 1964, and about 60,000 hunted in the Genesee River watershed deriving 640,000 hunter-days of use distributed as shown in table 28.

TABLE 28 - Estimated in-basin hunter use, 1964

Big game (1)	Small game: Birds	Small game: Mammals	Other
Use in Hunter-days			
174,000	155,000	187,000	124,000

(1) Primarily white-tailed deer.

As in the case of fishermen, about 50 percent of the hunters came from the Buffalo metropolitan area. However, these hunters were inclined to spend all of their annual hunting time in the Genesee basin. Also analogous to fishing use, comparison of hunting recreation with participation in other areas of the state and nation, indicates that there must be a considerable latent demand for hunting if available resource were sufficiently developed. Latent demand is estimated at 155,000 hunters for the service area at the present time, of which about 25,000 would be expected to hunt in the basin if attractive hunting opportunities were provided. Estimates of demand, with and without activation of the latent sector, are shown in table 29.

TABLE 29 - Service area and basin hunting demand

	Actual 1960	Projected 1980	Projected 2020
Service area	Numbers of hunters		
Total hunters (1)	160,000	230,000	290,000
Latent demand	155,000	180,000	320,000
Latent convertible to active demand (2)	0	80,000	320,000
Total, with activated latent demand	160,000	310,000	610,000
Hunting in Genesee River basin			
Total hunters (1)	60,000	78,000	117,000
Latent demand	25,000	34,000	60,000
Latent convertible to active demand (2)	0	20,000	60,000
Total, with activated latent demand	60,000	98,000	177,000
	Use in hunter-days		
Annual use without latent demand (1)	640,000	830,000	1,240,000
Annual use with latent demand (2)	0	1,300,000	2,300,000

(1) Based on 1960 participation rates and future population growth.
(2) Assuming improved hunting opportunity and revised in accordance with data from Appendix "N," Fish & Wildlife, dated May 1969.

150. Needs: Overall, the basin's wildlife resources are currently providing fairly satisfactory levels of hunting. However, to maintain this level and reasonably satisfy future demand will require resolution of such problems as lack of public access, destruction or alteration of wildlife habitat, and deficiencies of waterfowl habitat. About seven percent of the northern half of the basin is in private, non-profit club, or family-type hunting preserves and, at present trends, about 40 percent of the basin area suitable for hunting will be in such use by the year 2020. Increased urban and rural development will further restrict the hunting area available to the public. Except for waterfowl habitat needs, these problems are largely outside the scope of a water-related resource study but accelerated programs for acquisition, development and management of public hunting areas are evidently needed if the wildlife recreational potential of the watershed is to be realized.

151. HYDROELECTRIC POWER

Annual use of electric energy in the Genesee basin power market area, essentially the same area as the river basin encompasses, nearly doubled in each of the two decades from 1940 to 1960 and this rate of increase is likely to be maintained through 1980. Estimates for the more distant future were derived using expected rates of growth for the nation as a whole. Estimates for the basin power market area are shown in table 30.

TABLE 30 - Past and estimated future power requirements

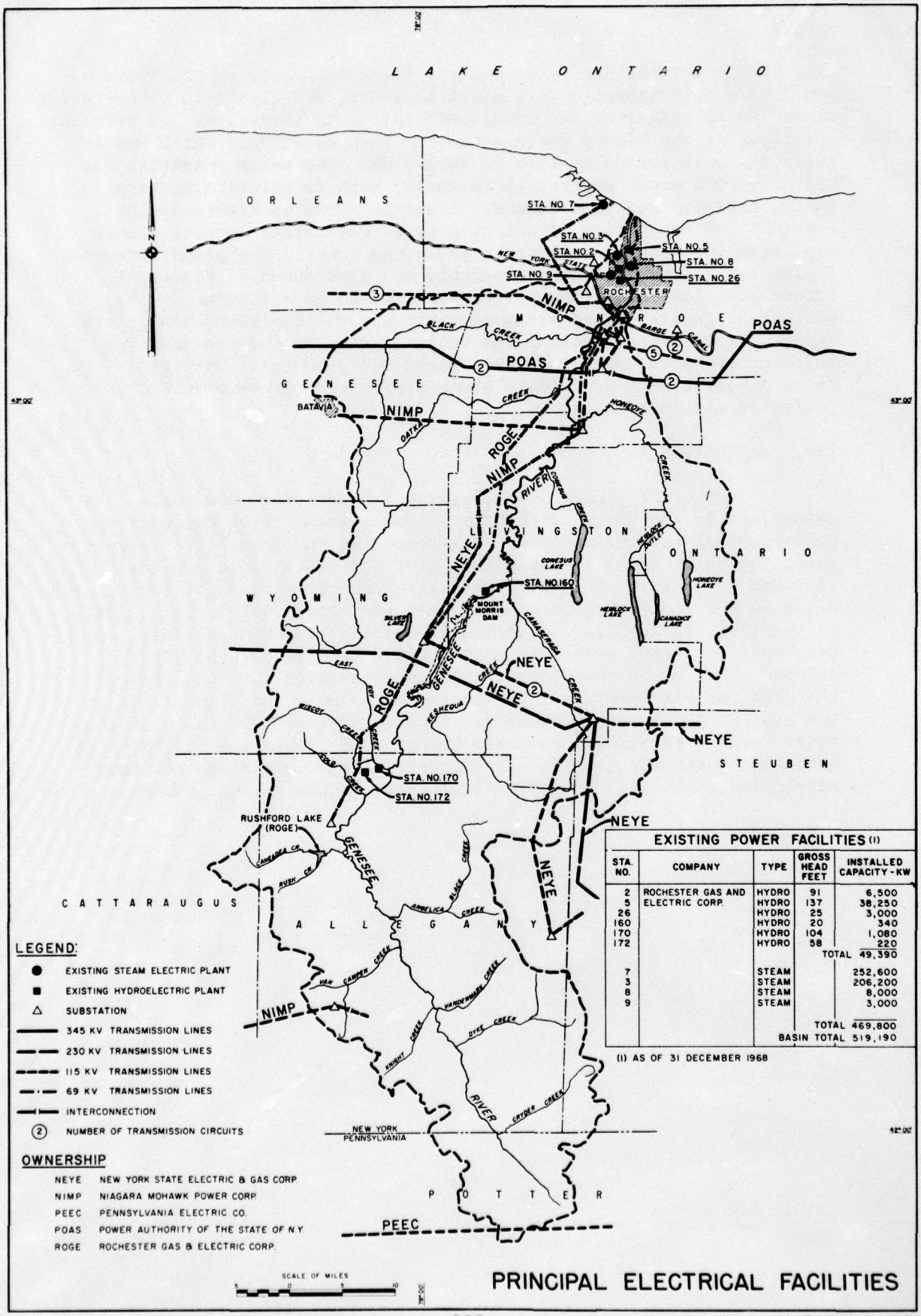
Year	Energy million kwh	Peak demand thousand kw	Load factor percent
1940(1)	534	118	51.5
1960(1)	1,999	428	53.2
1968(1)	3,780	716	60.0
1980	6,800	1,300	60.5
2000	18,000	3,370	61.0
2020	47,800	8,800	62.0

(1) Actual requirements.

152. Three private utilities and the Power Authority of the State of New York supply virtually all electric energy for the basin power market area. These utilities are interconnected among themselves and neighboring utilities in the highly coordinated New York Power Pool which has an estimated peak demand in 1990 of 48,100 MW. The basin potential for hydroelectric power generation is small, both in relation to total system capacity and peak demand. There is shown on figure 36 the location and capacities of existing power generation sources within the basin for both hydroelectric and steam power. The primary transission facilities including ownership are also shown on figure 36. Future base load requirements are expected to be met primarily by nuclear or fossil-fueled steam-electric plants supplemented by energy imports from sources outside the basin area as at the present time. In terms of basin needs, any economical hydroelectric capacity in the range of capability of Genesee River projects could be expected to assist in meeting peak loads.

153. NAVIGATION

A deep draft commercial navigation channel for lake vessels is maintained by the Corps of Engineers in the lower three miles of the Genesee River for the Port of Rochester. The port facility serves about 300 ships annually and principal products involved are coal, salt and newsprint. The New York State Barge Canal crosses the Genesee River in the southern part of Rochester and a terminal is maintained on the river in the city. Commercial traffic has been declining on the canal in recent years and only 200,000 tons of freight were shipped by barge in the Rochester-Lockport section in 1965. Use of the canal by pleasure craft has increased by more than four times in the past 10 to 15 years, however. Because of the three falls on the river between canal pool and Lake Ontario, no connecting waterway has ever been seriously considered. Commercial navigation has not been considered as related to basin development in the present study.



EXISTING POWER FACILITIES (1)

STA. NO.	COMPANY	TYPE	GROSS HEAD FEET	INSTALLED CAPACITY - KW
2	ROCHESTER GAS AND	HYDRO	91	6,500
5	ELECTRIC CORP.	HYDRO	137	38,250
26		HYDRO	25	3,000
160		HYDRO	20	340
170		HYDRO	104	1,080
172		HYDRO	58	220
			TOTAL	49,390
7		STEAM		252,600
3		STEAM		206,200
8		STEAM		8,000
9		STEAM		3,000
			TOTAL	469,800
			BASIN TOTAL	519,190

(1) AS OF 31 DECEMBER 1968

LEGEND:

- EXISTING STEAM ELECTRIC PLANT
- EXISTING HYDROELECTRIC PLANT
- SUBSTATION
- 345 KV TRANSMISSION LINES
- 230 KV TRANSMISSION LINES
- 115 KV TRANSMISSION LINES
- 69 KV TRANSMISSION LINES
- INTERCONNECTION
- (2) NUMBER OF TRANSMISSION CIRCUITS

OWNERSHIP

- NEYE NEW YORK STATE ELECTRIC & GAS CORP.
- NIMP NIAGARA MOHAWK POWER CORP.
- PEEC PENNSYLVANIA ELECTRIC CO.
- POAS POWER AUTHORITY OF THE STATE OF N.Y.
- ROGE ROCHESTER GAS & ELECTRIC CORP.

PRINCIPAL ELECTRICAL FACILITIES

FIGURE 36

154. SUMMARY OF NEEDS

In terms of existing supply, and existing and projected demands on water and related land resources, Genesee River basin and service areas have the greatest needs in the areas of general outdoor and fish and wildlife recreation, supplemental irrigation, municipal and industrial water and stream pollution abatement. These major demands are illustrated in figure 37. There are also other important needs for control of sediment production and deposition, erosion of stream banks and agricultural lands, electric power generation, and flood control. In the formulation process, projects and programs capable of meeting or partically meeting these identified needs were analyzed for economic feasibility and comparative work in developing the basin's water resources.

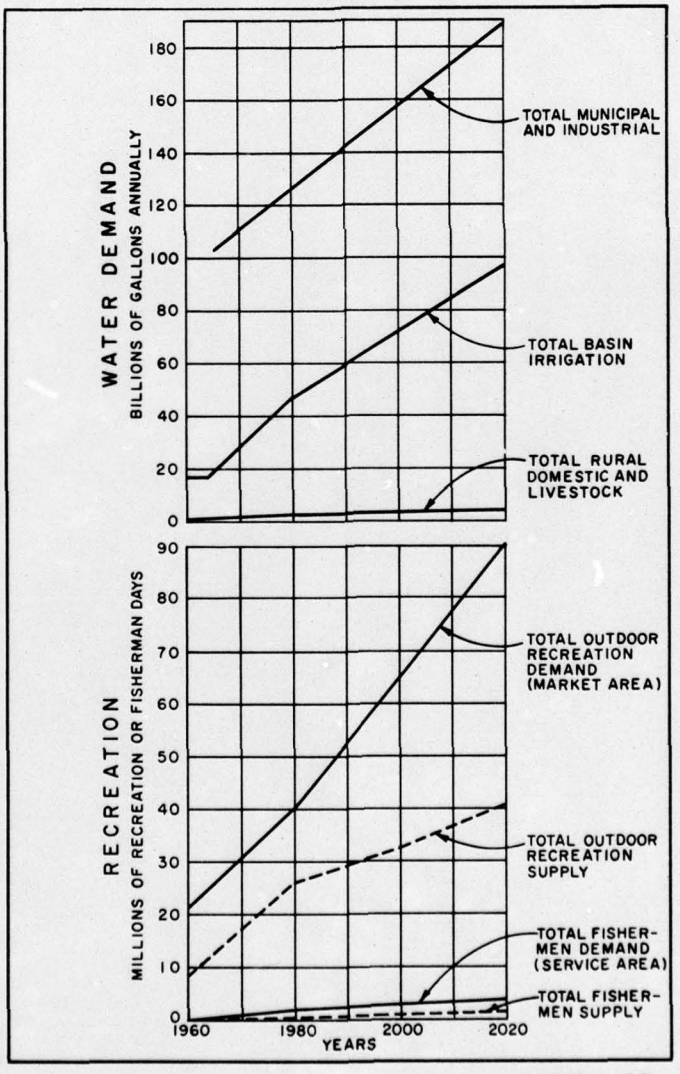


FIGURE 37

EVALUATION OF BENEFITS AND COSTS

155. CRITERIA

In accordance with principles established by the Coordinating Committee at the outset of the basin study, the primary considerations were that future water resource development needs be identified in general nature and scope, that detailed investigations sufficient for authorization be made only for Federal and Federally-assisted projects requiring initiation of construction within 10 to 15 years after study completion, that any investigation be terminated upon establishment that a justifiable improvement would not be produced, and that other non-Federal or Federal programs to supplement or utilize projects for which authorization is sought be identified as to general nature and scope. As the study developed, it was further concluded that project analysis would be oriented to the primary criterion of economic efficiency as reflected in the comparison of tangible benefits and project costs. Portions of the Genesee River basin and service area fall within the region covered by the Appalachian Water Resources Study and Genesee River basin projects within that region will be reanalyzed by the Appalachian Study group using evaluation techniques and criteria developed for that regional study. To maintain uniformity of analysis in the basin study, neither redevelopment benefits nor regional expansion-type benefits were included in evaluating projects for the Genesee River basin.

156. BENEFITS

Average annual benefits for the various purposes were estimated by the task groups concerned as documented in relevant appendices and were derived either for individual projects, or where a given purpose could be served by two or more projects, were derived for particular reaches or localities. Purposes providing benefits at projects investigated are further discussed in following subparagraphs.

a. Flood control - Benefits were based on reductions of flood damages as determined from discharge - damage - frequency relationships for selected reaches as described in Appendix "F," Flood Control. In general, beneficial effects attributable to reservoir sites were confined to single reaches and were not accumulative downstream. Potential benefits for major sites were small and not significant in project justification studies.

b. Water supply - Domestic, industrial and rural present and expected future demands for water were considered in 1964 to be capable of being adequately served by means other than reservoir storage as reported

in Appendix "H," Water Supply and Water Quality Management. However, studies by New York State consultants indicate that reservoir storage may provide the best alternative sources for water supply in certain areas. Water supply for supplemental irrigation was evaluated in Appendix "J," Agricultural Studies, and potential net benefits were based on increases in annual yield, net of on-farm costs, from lands expected to be irrigated. Sites capable of irrigating Ontario Lake Plain lands, and headwaters lands are analyzed in Appendix "J." Lands irrigable from major reservoir sites were capable of providing net benefits, estimated by the Department of Agriculture, of about $16.00 per acre on about 3,780 acres located below Stannard site. Major sites could also deliver water to the Genesee River-Barge Canal crossing for lands in the Ontario Lake Plain which would be irrigable from the canal. Net benefits on these lands would be about $21.00 per acre less the cost of delivery to the land from the canal.

c. Water quality - Benefits from improvement of water quality by low flow augmentation were computed on the basis of the least costly means of obtaining the same quality from a reservoir source, from advanced waste treatment, or from effluent transport. These three alternative methods are evaluated in Appendix "H," Attachment "B," for the seven critical stream sectors requiring corrective measures above secondary treatment. The annual benefits thus attributable to the purpose of water quality for any multiple-purpose reservoir were governed by alternative costs as follows:

1. Genesee River upstream of the mouth, effluent transport, $500,000;

2. Genesee River below Gates-Ogden-Chili, advanced waste treatment, $101,000;

3. Genesee River below Avon, advanced waste treatment, $55,000, (refer to table 16);

4. Oatka Creek below Warsaw, single purpose upland reservoir, $10,400;

5. Honeoye Creek below Honeoye Falls, advanced waste treatment, $19,800;

6. Wilkins Creek below Livonia, single purpose upland reservoir, $5,300; and

7. Mill Creek below Wayland, single purpose upland reservoir, $13,500.

d. Hydroelectric power - Power benefits were computed by using costs of the most likely alternative source, as determined in Appendix "L," to be a privately-financed steam plant in the vicinity of Rochester. On this basis, the Federal Power Commission furnished a benefit value of $19.00 per kilowatt-year for dependable capacity and an energy value of 2.3 mills per kilowatt-hour for average annual output. In accordance with Corps of Engineers criteria, the Federal Power Commission furnished benefit values for comparability purposes based on a federally-financed alternative. These values are $10.00 per kilowatt-year for dependable capacity and 2.3 mills per kilowatt-hour for average annual energy. The cost of pumping energy for pump storage projects was estimated at 3.0 mills per kilowatt-hour.

e. Recreation, fish and wildlife enhancement - Recreation benefits for general outdoor activities and for fishing were computed by the Bureau of Outdoor Recreation and the Fish and Wildlife Service based on estimated visitor-days and fisherman-days. Each reservoir site either Corps of Engineers or Soil Conservation Service was evaluated individually giving consideration to topography, ease of access, location, water-surface acreage, depth of water, pool fluctuation and type of fishery. Waterfowl areas were evaluated using a minimum value of 12.4 cents per waterfowl-use day. For those projects expected to be developed in stages, future increments of benefits were reduced to average annual equivalent values by appropriate discounting procedures. Additional data on general use recreation benefits can be found in Appendix "M," fishing benefits in Appendix "N," and waterfowl benefits in Appendix "C," Part IV.

157. COST ESTIMATES

First costs for considered projects included expenditures for construction, lands, relocations, clearing, engineering and design, and supervision and administration. Project costs used for major reservoirs and local protection projects are given in detail in Appendix "C," Project Designs and Cost Estimates. Prices are based on bid prices for similar work with adjustments made for price levels, quantity variance, and availability of materials, The estimates for power facilities are given in detail in Appendix "L," Hydroelectric Power, and costs for recreation facilities, including discounted costs for future additions, are derived in Appendix "M," Outdoor Recreation. Waste treatment facility costs are found in Appendix "H," Water Supply and Water Quality Management. Upland structure costs are found in Appendix "J," Agricultural Studies. The unit prices used for the upland structures are based on a comparative study of actual contract cost of structures which were installed in the northeast United States under Public Law 566.

158. Annual charges for projects analyzed include interest and amortization of total investments with an interest rate of 3-1/8 percent for a 100-year period on all reservoirs investigated and a 50-year period on local flood protection projects, operation and maintenance cost, and annual equivalent costs of major replacements for facilities for power, waste treatment and future recreation developments.

159. COST ALLOCATION

Allocation of costs for the multiple-purpose features of the major projects considered for the early-action plan were made using the separable cost-remaining benefits method. The separable costs of each user purpose was allocated to that purpose and the joint costs allocated to the user purposes.

160. APPORTIONMENT OF COSTS

Federal costs and the apportionment to non-Federal interests for the major multiple-purpose projects were in accordance with standard Corps of Engineers criteria for flood control. The proposed power development features for this study were assumed to be a Federal undertaking. Water quality improvements on the main stem of the Genesee River were considered widespread and nonreimbursable in accordance with the Federal Water Pollution Control Act Amendments of 1961 (PL 87-88). Cost sharing for recreational features was in accordance with the Federal Water Project Recreation Act of 1965 (PL 89-72) and non-Federal interests were assigned one-half of the separable cost allocated to recreation, and all costs of operating maintenance and replacement of recreation and fish and wildlife lands and facilities.

161. Apportionment for the Soil Conservation Service upland structures was based on the current cost sharing criteria of the Watershed Protection and Flood Prevention Act (PL 566).

CORRECTIVE MEASURES AND PROGRAMS CONSIDERED

162. STRUCTURAL MEASURES

Reservoirs to be impounded by dams across the main river or tributaries were considered for providing needed acreages of water surfaces for general recreation and for fish and wildlife habitat and related recreational pursuits. Reservoirs were also considered as providing opportunities for conventional or pumped storage hydroelectric power development, releases of impounded waters in time of need for water quality improvement and irrigation, for control of flood flows, and for the relatively minor domestic water supply needs not expected to be met by existing sources. Other structural measures, considered for capability to meet needs in particular resource areas, included developments adjacent to existing waters for water-oriented recreation; waste treatment facilities (including possible advanced treatment works), or facilities for diversion of wastes to improve surface water quality; bank protection works or channel improvement projects for erosion control; and local protection works, channel improvement or flood-proofing structures for reduction of flood damages.

163. NON-STRUCTURAL MEASURES

Non-structural measures considered were increased public access or removal of restrictions on existing waters for general recreation, hunting and fishing; changed techniques in management of agricultural and forest lands, reforestation and associated land treatment measures; and flood plain zoning, flood warning and forecasting systems for flood damage reduction.

164. GENERAL PROCEDURE

Owing to the study schedule and funding arrangements, preliminary analysis of potentially beneficial projects was initiated concurrently with studies for identifying and quantifying the basin's problems and needs. In cooperation with other agencies participating in the appropriate task groups, sites for potential reservoirs on the river and major tributaries were identified and studied by the Corps of Engineers. Upland reservoir sites were similarly investigated by the Soil Conservation Service, U. S. Department of Agriculture. Data from previous studies, and input supplied by other task groups as the study progressed, were used for initial screening of sites. In the screening process, sites with greatest potential for meeting indicated needs, were selected for more detailed evaluation. Resource problems resolvable by means other than reservoir storage were identified and analyzed by the particular task groups concerned.

165. PRELIMINARY ANALYSIS - MAJOR RESERVOIRS

Map studies and field reconnaissance identified 14 reservoir sites with potential for multiple-purpose use. Site locations are shown on figure 39 and maximum available storages are shown graphically on figure 38. Of these 14 sites, 9 were eliminated because of an unfavorable benefit-cost ratio, these projects are shown in table 31. Project description, design data and preliminary cost estimates are given in Appendix "C." Potential benefits, net of identifiable specific costs, were based on single-purpose development and were compared with project costs to determine which of the sites considered would warrant further study. The sum of benefits so derived would exceed total benefits which could be realized from multiple-purpose operation, but the larger figure served as an indicator of potential feasibility.

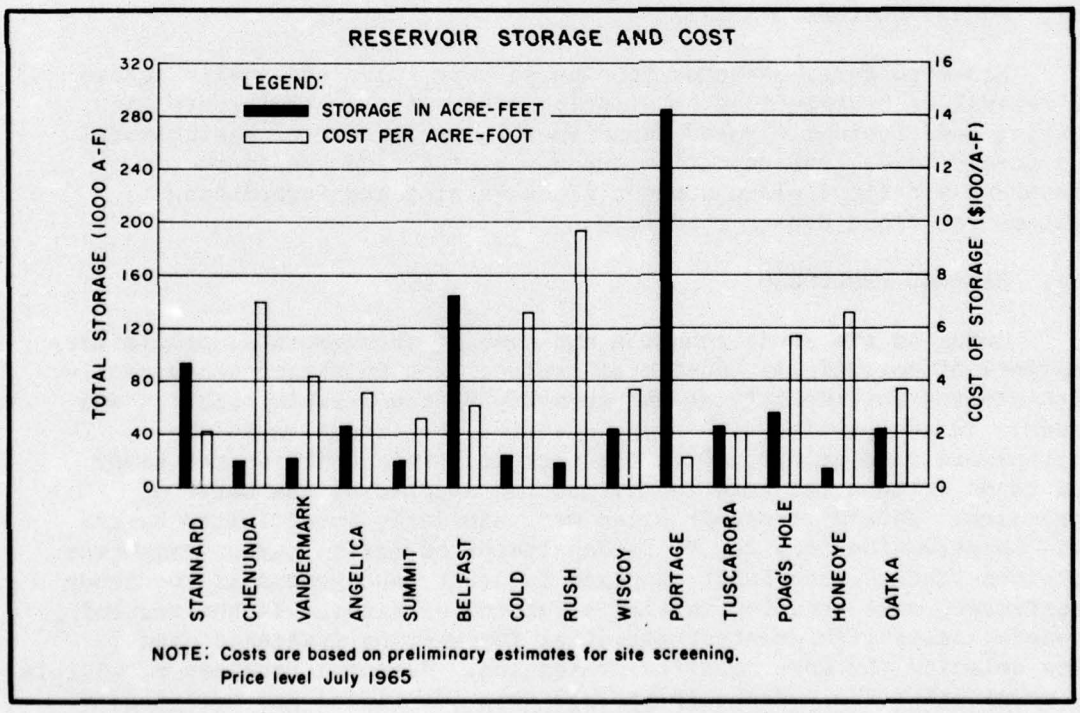
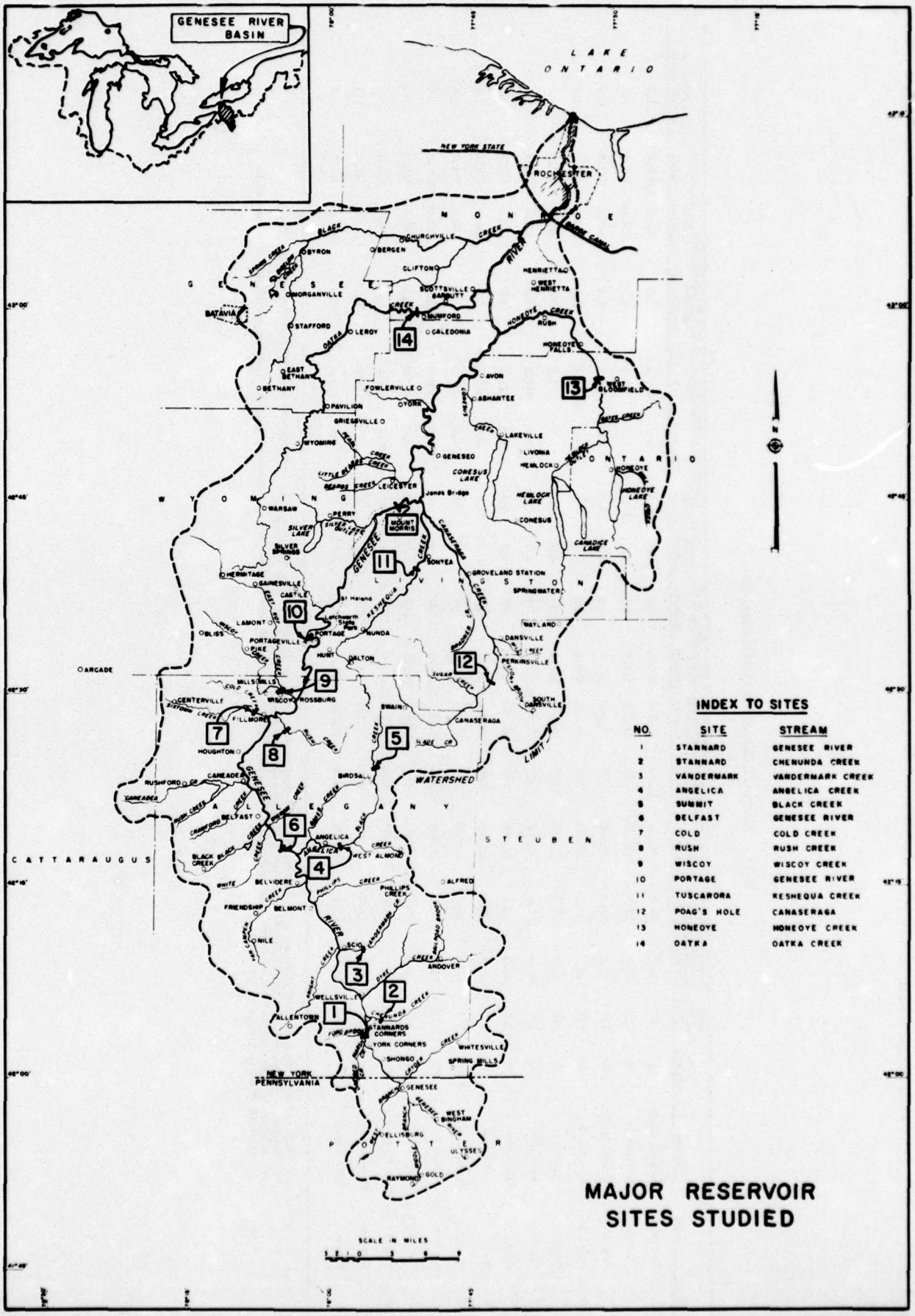


FIGURE 38



INDEX TO SITES

NO.	SITE	STREAM
1	STANNARD	GENESEE RIVER
2	STANNARD	CHENUNDA CREEK
3	VANDERMARK	VANDERMARK CREEK
4	ANGELICA	ANGELICA CREEK
5	SUMMIT	BLACK CREEK
6	BELFAST	GENESEE RIVER
7	COLD	COLD CREEK
8	RUSH	RUSH CREEK
9	WISCOY	WISCOY CREEK
10	PORTAGE	GENESEE RIVER
11	TUSCARORA	RESHEQUA CREEK
12	POAG'S HOLE	CANASERAGA
13	HONEOYE	HONEOYE CREEK
14	OATKA	OATKA CREEK

MAJOR RESERVOIR SITES STUDIED

FIGURE 39

TABLE 31 Preliminary data summary - major reservoirs

No.	Site	Stream	D.A. (sq mi)	Max. dam hgt. (ft.)	Storage capacity (1000 A-ft) Total	Active	First costs ($1000) Dam & reservoir	Real estate	Investment	Annual charges (1) Total ($1000)	$/A-ft	Potential average annual benefits ($1000) (2) Flood Control	Irrigation	Power	Water quality (3)	Outdoor recreation	Fish & Wildlife	Total	Total Benefits ÷ annual costs
1	Stannard	Genesee River	168	90	93.5	91.0	17,400	1,250	19,816	706.2	212	17.7	20.1	4.0	494.0	7.8	742.0	1,286.0	1.8
2	Chenunda	Chenunda Cr.	29	130	20.0	19.6	13,000	460	14,081	511.0	704	5.7	20.1	5.0	106.5	1.7	135.0	274.0	0.5
3	Vandermark	Vandermark Cr.	20	130	20.2	19.9	8,700	140	9,300	343.0	420	1.0	15.9	2.0	108.0	1.9	128.0	256.8	0.8
4	Angelica	Angelica Cr.	54	130	45.7	39.4	15,100	770	16,574	597.0	362	8.6	7.2	5.0	214.0	86.4	375.5	695.7	1.2
5	Summit	Black Creek	20	54	20.0	18.0	4,900	110	5,166	189.2	258	4.2	7.2	0	97.8	3.5	495.0	607.7	3.2
6	Belfast	Genesee R.	580	110	145.0	127.4	39,800	2,200	44,625	1,538.0	308	4.4	7.2	23.0	500.0	13.3	337.0	884.9	0.6
7	Cold	Cold Creek	40	140	23.8	23.1	14,500	230	15,650	565.7	658	0.5	4.8	6.0	125.4	3.0	138.0	277.7	0.5
8	Rush	Rush Creek	39	130	18.6	18.1	16,800	105	17,962	643.4	966	0.6	4.8	4.0	101.0	1.4	166.0	277.8	0.4
9	Wiscoy	Wiscoy Cr.	108	160	43.2	42.7	14,800	250	15,990	577.5	370	3.5	2.4	22.0	234.0	1.8	88.0	351.7	0.6
10	Portage	Genesee R.	985	130	283.0	251.0	23,100	5,300	30,919	1,057.0	109	0	0	1,280.0	500.0	818.0	629.0	3,233.0	3.1
11	Tuscarora	Keshequa Cr.	68	145	46.0	43.7	8,300	550	9,265	343.5	201	2.6	0	7.0	237.0	63.4	346.0	656.0	1.9
12	Poag's Hole	Canseraga Cr.	89	210	56.0	53.0	30,000	215	32,103	1,122.0	573	9.0	6.9	26.0	287.5	—	196.0	525.4	0.5
13	Honeoye	Honeoye Cr.	189	70	13.6	12.8	8,300	250	8,951	331.0	658	—	12.3	0	69.5	6.7	--	88.5	0.3
14	Oatka	Oatka Creek	188	110	44.5	43.7	14,700	640	16,299	587.8	366	6.7	0	7.0	237.0	301.0	215.0	766.7	1.3

(1) Includes interest and amorization at 3-1/8 percent over 100-year period, engineering and design, supervision and administration, operation and maintenance.
(2) Maximum benefits, net of specific costs, obtained by single-purpose reservoir operations.
(3) Based on meeting portion of flow augmentation requirement for lower Genesee River below Court Street Dam in Rochester, and with total potential benefits limited to cost of alternative waste treatment facilities.

166. Potential flood control benefits were generally inconsequential, ranging downward from about 2-1/2 percent of annual cost for Stannard reservoir down to one percent and less at other sites. Power benefits tabulated were derived from on-site generation and the power inventory of Appendix "L" established that benefits would not meet the test of comparison with the least-costly steam alternative except at the Portage site. Water quality benefits were based on prorated portions of the storage needed for the dilution requirements in the Genesee River downstream of Court Street dam at Rochester and, except for the Portage and Belfast sites, could be met only by combinations of two or more of the smaller sites. In any practical combinations, virtually all of the active storage in the smaller sites would be needed, for water quality, substantially reducing possible benefits from other purposes. Potential irrigation benefits, like water quality benefits, were based on meeting requirements in common reaches and the sites would be competing on a cost per unit of storage basis. Water supply for municipal, industrial and rural domestic use was not considered in view of the determination by the responsible task group that sources other than reservoir's were adequate in quantity and quality and more likely to be developed to meet indicated future needs.

167. Selection of sites for more detailed study was based on indicated feasibility, ability to provide substantial benefits for more than a single project purpose, and economy per unit of storage. On this basis the five sites selected were Portage, Stannard, Tuscarora, Angelica and Belfast. The first three were selected primarily because feasibility as multiple-purpose sites were indicated. Angelica was selected for multiple-purpose potential and to resolve the marginal economic feasibility. Belfast was selected, despite indicated infeasibility, partly because of relatively low unit cost but primarily to have sound cost data should studies subsequent to the preliminary analysis reveal unforeseen needs for the large storage capacity available at the site. Summit site, with over 80 percent of total benefits from fish and wildlife enhancement possibilities, and Oatka site, with about 70 percent of total benefits in general recreation and fish and wildlife enhancement, were concluded to be best suited for single-purpose development. Further cost data were not requested for either of these two sites. Table 32 summarizes conclusions drawn from the preliminary analysis of major reservoir sites.

TABLE 32 - Summary of analysis

No	Site Name	Multiple-purpose	Indicated feasibility	Potential purposes	Selected
1	Stannard	Yes	Yes	1. Fish and wildlife 2. Water quality 3. Irrigation 4. Flood control 5. General recreation	Yes
4	Angelica	Yes	Marginal	1. Fish and wildlife 2. Water quality 3. General recreation 4. Flood control	Yes
5	Summit	No	Yes	1. Fish and wildlife 2. General recreation	No (1)
6	Belfast	Yes	No	1. Water quality 2. Fish and wildlife 3. General recreation	Yes (2)
10	Portage	Yes	Yes	1. Power 2. General recreation 3. Fish and wildlife 4. Water quality	Yes
11	Tuscarora	Yes	Yes	1. Fish and wildlife 2. Water quality 3. General recreation	Yes
14	Oatka	No	Marginal	1. General recreation 2. Fish and wildlife	No (3)

(1) Best use would be single-purpose fish and wildlife project.
(2) Included because of large storage capacity.
(3) Best use would be single-purpose general recreation, particularly because of proximity to Rochester metropolitan area.

168. PRELIMINARY ANALYSIS - UPLAND RESERVOIRS

The structural program for upland reservoirs by the United States Department of Agriculture was based first on a study of potential structure site locations and second, selecting those structures which appear feasible to meet preliminary needs and benefits determined by the several task groups. These task groups represent the purposes of municipal and industrial water and low flow augmentation, recreation and fish and wildlife, flood control and irrigation.

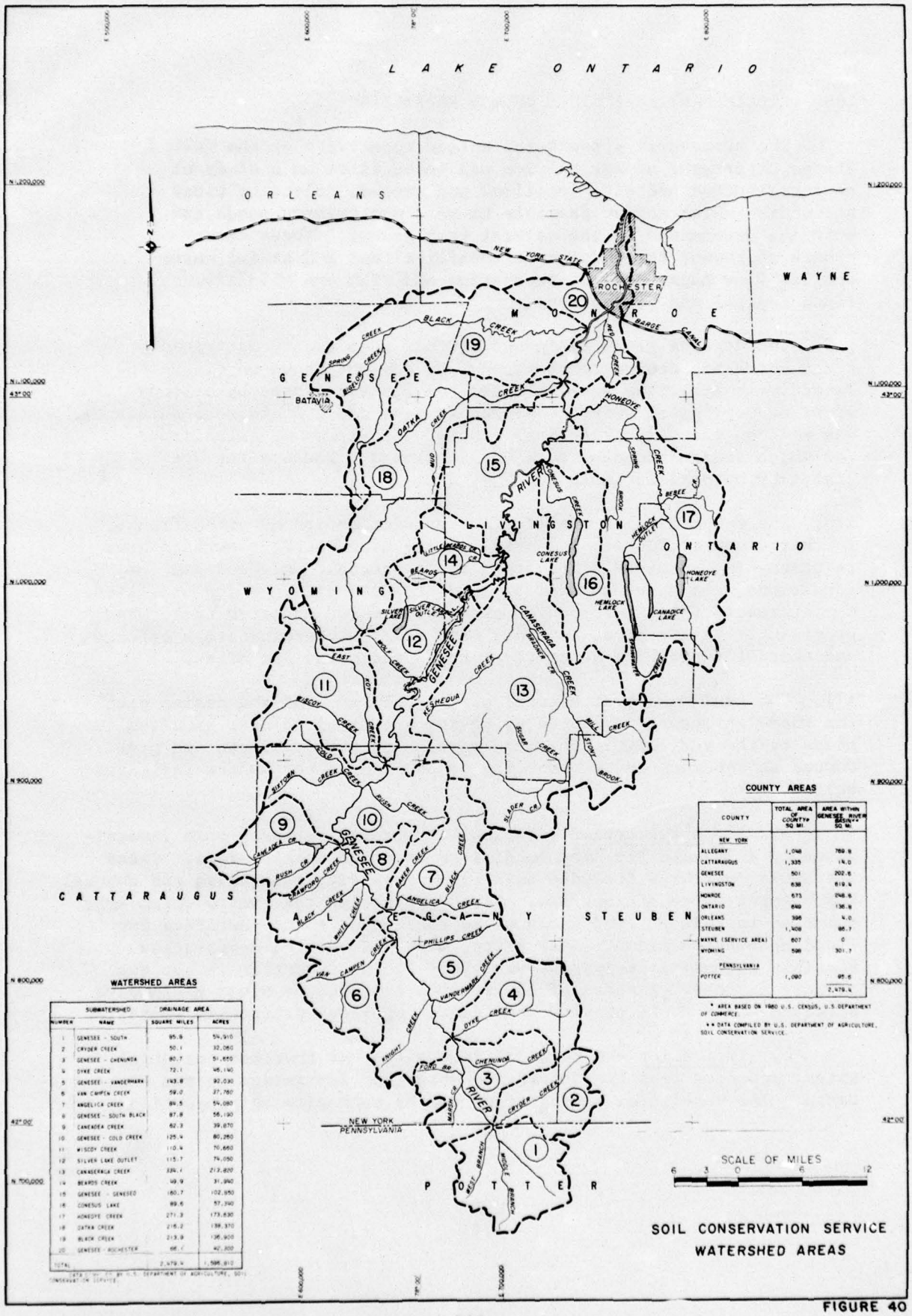
169. The Genesee River Basin was divided into twenty watershed areas which are designated 1 through 20 and are shown on figure 40. Tentatively locations were selected for 226 structures by a study of U. S. Geological Survey topographic maps and a field reconnaissance was made on each site. A final list of 101 sites was established for which design and cost data was developed. These sites are listed by purpose in table 33.

170. The factors which resulted in the elimination of sites from further study included: potential needs, stage-storage-surface area relationship, required flood storage, topographic and geologic conditions, and apparent cost of land, roads, buildings and utilities. Centerline profiles were run on structures which appeared to be most promising. Valley cross-sections were run to determine storm effects and channel capacities at critical areas and below dam sites.

171. The preliminary structural plan presented cost and design data for those structures selected as having potential to meet expected needs by the year 2020. The structural plan was developed and presented as separate units according to purpose in the manner indicated below:

a. Flood Prevention - Various structural measures were investigated to alleviate flooding conditions at noted damage areas. These structural measures included both flood retarding reservoirs and channel improvement where appropriate. Flood prevention reservoirs which were selected to reduce flood damages are too costly to be justified for flood prevention alone. Some sites, may, however, be constructed feasibly for multiple-purpose use where flood prevention is not the primary purpose. A total of 31 sites in the Genesee River Basin were selected which would provide some degree of flood prevention benefits.

b. Irrigation - A total of five sites, of fourteen potential sites, appeared feasible to provide water for irrigation in the Genesee Basin. The beneficial storage provided by each site is proportional to



WATERSHED AREAS

NUMBER	SUBWATERSHED NAME	DRAINAGE AREA SQUARE MILES	DRAINAGE AREA ACRES
1	GENESEE - SOUTH	95.9	54,910
2	CRYDER CREEK	50.1	32,060
3	GENESEE - CHENUNDA	80.7	51,660
4	DYKE CREEK	72.1	46,140
5	GENESEE - VANDERMARK	143.8	92,030
6	VAN CAMPEN CREEK	59.0	37,760
7	ANGELICA CREEK	84.5	54,080
8	GENESEE - SOUTH BLACK	87.8	56,190
9	CANEADEA CREEK	62.3	39,870
10	GENESEE - COLD CREEK	125.4	80,260
11	WISCOY CREEK	110.4	70,660
12	SILVER LAKE OUTLET	115.7	74,050
13	CANASERAGA CREEK	334.1	213,820
14	BEARDS CREEK	49.9	31,940
15	GENESEE - GENESEO	160.7	102,850
16	CONESUS LAKE	89.6	57,390
17	HONEOYE CREEK	271.3	173,630
18	OATKA CREEK	216.2	138,370
19	BLACK CREEK	213.9	136,900
20	GENESEE - ROCHESTER	66.1	42,300
TOTAL		2,479.4	1,586,810

DATA COMPILED BY U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE.

COUNTY AREAS

COUNTY	TOTAL AREA OF COUNTY* SQ MI	AREA WITHIN GENESEE RIVER BASIN** SQ MI
NEW YORK		
ALLEGANY	1,046	788.8
CATTARAUGUS	1,335	14.0
GENESEE	501	202.6
LIVINGSTON	638	619.4
MONROE	673	648.6
ONTARIO	640	136.8
ORLEANS	396	4.0
STEUBEN	1,408	88.7
WAYNE (SERVICE AREA)	607	0
WYOMING	598	301.7
PENNSYLVANIA		
POTTER	1,090	95.6
		2,479.4

* AREA BASED ON 1980 U.S. CENSUS, U.S. DEPARTMENT OF COMMERCE.

** DATA COMPILED BY U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE.

SOIL CONSERVATION SERVICE
WATERSHED AREAS

FIGURE 40

TABLE 33 - Preliminary data summary - upland reservoirs

Breakdown of potential sites by purpose

Site Purposes	Watershed Area Numbers																					Total (1)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Flood Prevention (2)	4	2	1	1	3	2	1						2									16
Irrigation											2	1										3
Fish & Wildlife					1				1	1		1	2	3	5	1	8	1	2	1		27
Recreation										2												2
Water Supply (3)				1		1																2
Regulation (4)					1			2		4												7
Low Flow Augmentation													1			1		4	1			7
Flood Prevention and Recreation	1				1																	2
Flood Prevention and Regulation		1	1	2			1															5
Flood Prevention and Fish & Wildlife			1		1		1						1									4
Flood Prevention and Irrigation											1		2									3
Flood Prevention and Water Supply													1									1
Irrigation and Fish & Wildlife											1						2	1	1			5
Irrigation and Regulation											1				2							3
Fish & Wildlife and Water Supply													2									2
Fish & Wildlife and Low Flow Augmentation																1	1					2
Fish & Wildlife and Recreation			1				1	1					1	1		1			1	1		8
Fish & Wildlife, Recreation and Water Supply															1		1					2
TOTAL NUMBER OF SITES (1)	5	3	4	4	6	4	4	3	1	7	5	2	12	4	8	4	12	6	5	2		101

(1) Sites for which design and cost data was developed by U. S. Department of Agriculture in their "Preliminary Upstream Reservoir Studies," August 1966.
(2) Not feasible by year 1980.
(3) Municipal and Industrial.
(4) Maintaining pool at Downstream Sites.

the number of acres available to irrigate from that particular structure. Multiple-purpose use of an irrigation reservoir is limited due to the wide fluctuation of the water level. This fluctuation is not conducive to such uses as recreation or fish and wildlife habitat. However, such sites could be constructed to provide additional storage for other water supply needs. Only three watersheds (11, 17 and 19) were involved in the final determination of feasible irrigation structures in the Basin. In all of them, one site was sufficient to supply irrigation water to the majority of the irrigable acreage although alternative sites were available in each.

c. Fish and Wildlife - Coordinating agencies in the Fish and Wildlife studies, determined that twenty-three impoundment sites would be feasible for fish and wildlife habitat. These sites were recommended based upon preliminary needs and benefits. In addition, preliminary designs and cost estimates were made for twenty-seven sites that showed a potential to meet increased needs by the year 2020.

d. Recreation - The fourteen sites selected for recreational use were those recommended by the Recreation Studies group and other sites which appear suitable for smaller type recreational development. Thirteen of these sites appear feasible for development. Factors affecting the structural selection included the availability of access, fluctuation and size of water surface, characteristics of surrounding terrain and vegetation, dependability water yield, and geology conditions affecting leakage.

e. Low flow augmentation and municipal and industrial water supply - These sites were selected based upon project needs furnished by the Water Quality Management group. Nine sites were selected for low flow augmentation and seven for municipal and industrial water supply. All structures selected were located near problem areas and have good permanent storage potential. Multiple-purpose use of these sites is probably limited to flood prevention, irrigation, and regulation of a downstream site. Four sites appear feasible for low flow augmentation and one site for municipal and industrial water supply.

f. Regulation of a downstream site - The purpose of sites selected for regulation is to provide a dependable and regulated water supply for maintenance of a stable recreation pool at a larger structure located downstream. The large downstream site considered in this study is located near Portage, New York on the Genesee River. It is a Corps of Engineers, multiple-purpose reservoir site, involving a major recreation pool. Fifteen sites were selected as potential regulation sites for use in conjunction with the Portage site to obtain a stable pool, thus allowing maximum recreation benefits while obtaining other benefits from power and water quality.

172. ONTARIO LAKE PLAIN SERVICE AREA

In an attempt to provide for a deficit in irrigation water supply, as shown in table 34, an engineering inventory was made of all potential water impoundment sites on the Ontario Lake Plain. Those sites which appeared to be feasible from an engineering standpoint were analyzed further to determine their potential for supplying irrigation water.

TABLE 34 - Projected irrigation water needs[1] by decade, Ontario Lake Plain Service Area, 1980-2020.

	1980	1990	2000	2010	2020
Acres in vegetables	26,720	27,050	27,660	28,180	27,670
Acres to be irrigated	13,360	27,050	27,660	28,180	27,670
Current deficit in acre feet of water[2]	7,910	21,600	22,210	22,730	22,220

(1) One acre-foot stored for each acre to be irrigated.
(2) Deficit beyond current irrigation water available and used.

173. The analysis can be broken into several sections. First the quantity of water necessary to irrigate an acre of cropland in this area was determined. Based upon antecedent soil moisture, probable rainfall and consumptive use by crops, a water budget was developed. This budget encompassed the water needed by the plant plus losses due to efficiency of application, transportation and storage. Ultimately, it was determined that about one acre-foot of water should be stored for each acre of land to be irrigated.

174. Next, the potential benefits due to irrigation were calculated. It was determined early in the study through the examination of partial budgets that the economic feasibility of the irrigation of crops other than vegetable and specialty crops would be doubtful. Therefore, the benefits from supplemental irrigation of a composite acre of vegetable crops were developed using projected local irrigation costs, expected yield response and projected market prices. It was determined that net benefits from the irrigation of vegetable crops in the Ontario Lake Plain would be about $21.00 per acre. This figure was used for all irrigation benefits. The acres to be irrigated from each site were then determined. The one limit to the total acres to be irrigated is

the projected acres of vegetables in the Ontario Lake Plain. Then surrounding each site, the soil and topography placed another limitation. All areas capable of being irrigated by reason of appropriate soils and slopes were delineated on U. S. Geological Survey maps into groups separated by drainage needs. Only those areas requiring no drainage or random drainage were considered to be economically feasible to irrigate. This is due to the high annual cost of systematic drainage systems in relation to the expected irrigation benefits. Crop rotation systems and water transportation losses limited the remaining acreage to thirty percent of the irrigable land within one-half mile of the site or stream and not more than five miles downstream. A preliminary plan was prepared for each site and costs estimated using a capacity as near to the irrigation needs as possible.

175. In total, forty-one irrigation systems were investigated and twenty-nine irrigation systems capable of supplying water to about 13,000 acres of land were found to have favorable benefit-cost ratios. Several of the proposed systems had benefit-cost ratios of less than one to one but were included in the list due to the fact that a slight change in either the percent of land to be irrigated or the type of crop to be irrigated could easily render them feasible within the currently acceptable limits.

176. Present irrigation water supplies plus the additional 13,000 acre-feet from the proposed system could irrigate 18,000 acres annually, or about 10,000 acres less than the total desired. This deficit could be resolved in part through several methods. Local development of smaller sites serving one or several landowners is quite feasible in many areas. These sites are not readily apparent from the maps used in the original site inventory and will require the services of field technicians to locate. In addition, there are some surface and groundwater sources which are not fully developed at present. Concentration of effort on these sources along with an integrated program of group structure development could materially diminish, if not eliminate, any future deficit in irrigation water supplies on the Ontario Lake Plain.

177. LOCAL PROTECTION PROJECTS

There were several locations in the Basin where local flood protection projects appeared feasible. These locations were Warsaw on Oatka Creek, Red Creek and the Canaseraga Valley.

178. A project was completed under Public Law 685 at Warsaw on Oatka Creek in July 1968. An interim report was prepared for Red Creek and it was authorized by the Rivers & Harbors Act of 1966.

179. The Canaseraga Valley, a rich agricultural area, was investigated in the study jointly by the Corps of Engineers and the Soil Conservation Service. Several alternative structural plans were developed as follows:

a. Poag's Hole Reservoir;

b. Tuscarora Reservoir;

c. Poag's Hole and Tuscarora Reservoir as a system;

d. A system of six Soil Conservation Service reservoirs;

e. A system of S.C.S. reservoirs in conjunction with Poag's Hole and Tuscarora Reservoirs

f. Channel enlargement

g. Channel enlargement with a barrier levee.

A feasible project to give five year summer protection to the valley was developed by the combination of channel enlargement and a barrier levee across the valley. The project is explained in detail in Appendices "B" and "C".

180. WATER QUALITY MANAGEMENT

Parameters investigated to establish quality characteristics of basin waters included dissolved oxygen, BOD, acidity, coliform bacteria, phosphates, turbidity, temperature, dissolved solids and color. Limiting criteria for all parameters were not established but the Genesee River, from the headwaters in Pennsylvania to the mouth at Lake Ontario, is an interstate stream. The water quality standards established for use by State of New York in this study have been subsequently accepted and approved by the Secretary of the Interior, in accordance with the requirements of the Water Quality Act of 1965. For purposes of the present study, a dissolved oxygen concentration of 4.0 milligrams per liter was used as the minimum acceptable for basin streams. Assuming waste loadings and treatment levels detailed in paragraphs 127-129, this dissolved oxygen requirement could be met by exclusion or diversion of wastes, by advanced treatment of wastes, or by flow augmentation. Table 35 shows requirements for advanced treatment, in terms of percent removal of BOD, if additional dilution water is not provided.

TABLE 35 - Advanced waste treatment needs

Stream Sector	Year advanced treatment becomes necessary	% removal of BOD 1980	2020
Genesee River			
Kodak	1965	92	94
Gates-Chili-Ogden	1990	--	93
Oatka Creek			
LeRoy			
Warsaw	1965 (92%)	94	95
Honeoye Creek			
Honeoye Falls	1965 (96%)	98	98
Mill Creek			
Wayland	1965 (93%)	94	95
Silver Lake Outlet			
Perry	1965 (93%)	96	96
Wilkins Creek			
Livonia	1965 (94%)	95	96

181. LAND MANAGEMENT

It is apparent from the projected decline in cropland acreage that the land resources of the Basin will have to be managed more intensively if they are to maintain their productive capacities. Proper use and management of these and forest land must be recognized.

182. Land treatment measures are needed and will be applied in all parts of the Basin. The measures will include those required to reduce soil erosion, alleviate excess water and improve unfavorable soil conditions on cropland. Measures to be included on pasture lands include the establishment and improvement of cover conditions and protection from overgrazing, erosion and excess water. Forest land measures will include establishment of timber stands, improvement of hydrologic conditions, erosion control features as well as protection of some woodlands from overgrazing. The total acreage needing treatment with the conservation program required are shown on table 36.

TABLE 36 - Total conservation program description

Land use	Problem	Total acres in basin	Acres needing treatment	Program description
Cropland:				
	Erosion		218,000	Contouring, strip cropping, diversions and grassed waterways
	Excess water: Unfavorable		90,000	Tile drains, open ditches
	Soil		4,000	Conversion to pasture or woodland
		627,000	312,000	
Pasture				
	Poor cover		120,000	Improve by planting, mowing and fertilizing
	Erosion & excess water: Overgrazing		27,000	Tile drains, open ditches and diversions
			7,000	Better land management
		240,000	154,000	
Forest				
	Poor cover		96,500	Planting, exclude cattle
	Grazing		27,000	Fencing
	Hydrologic		145,000	Thinning, weeding and sanitation cutting
	Erosion		2,700	Draining and stabilizing old logging roads, trails; reinforcement planting
		428,000	271,200	

183. The Forest Service considered programs to reduce erosion and sediment, thereby improving water quality. Also the improvement of the hydrologic condition of treated areas, increase the ability of those areas to infiltration and detention of storm runoff. The present level of accomplishments under current programs was re-evaluated and the acceleration of programs developed to meet the 1980 needs. The current and proposed programs for the forest lands are shown in table 37.

TABLE 37 - Current and proposed program for forest land treatment measures - 1966

Practice	Acres needing treatment	Annual accomplishments under current programs	Acceleration above current programs	Proposed total program to 1980
Management plan		60 plans	870 plans	1,650 plans
Tree planting	96,500	1,800 acres	12,100 acres	35,500 acres
Hydrologic stand improvement	145,000	1,100 acres	8,700 acres	23,000 acres
Woodland grazing control (fencing)	27,000	500 acres 2 miles	8,500 acres 34 miles	15,000 acres 60 miles
Erosion control - skid trail and logging road	2,700	40 acres 1 mile	480 acres 12 miles	1,000 acres 25 miles
TOTAL	271,200	3,440 acres	29,780 acres	74,500 acres

184. WATERFOWL AREAS

Waterfowl habitat is in short supply in the basin. There has been a constant reduction of waterfowl habitat as a result of agriculture, industrial and municipal development, which are destroying waterfowl habitat at a rapid rate. There is little opportunity for replacement. More wetland areas should be placed in public ownership, if we are to meet future recreational needs, not only for hunting, but for opportunities to observe and photograph waterfowl.

185. Since loss of waterfowl hunting could be a project-related effect of any reservoir project, this loss should be mitigated. Mitigation can be accomplished by acquisition and development of oxbows on the main river or its tributaries, as part of the comprehensive water resource development program.

186. The shallow marshes of Honeoye, and Conesus Lakes are being converted by development agencies into land fill areas for cottages. This development has the two-fold effect of destroying waterfowl habitat and fish spawning areas. The remaining marshes should be saved and improved for waterfowl through acquisition and development projects.

187. The most important wetland units in the basin are the Groveland Flats on lower Canaseraga Creek, the dozen or so oxbows below Mt. Morris Dam. Birdsall Swamp on the headwaters of Black Creek (tributary of Angelica Creek), and the shallow marshes associated with Honeoye, Canadice, Hemlock, and Conesus Lakes. All of these areas, with the possible exception of Birdsall Swamp, are in danger of being reduced in area or eliminated by land-use changes.

188. RECREATION

The formulation procedure followed for the selection of reservoir sites, for recreation development, was quite similar to that followed for selection of Fish and Wildlife sites, in that all were screened for physical and economic feasibility first and then chosen on their ability to meet a total projected recreation need.

189. The Genesee River Basin is an area that offers many opportunities for recreation and these were considered in evaluation of recreation needs and future demands. The terrain is ideal for recreation in that it varys from gentle rolling hills in the north to rugged wooded topography in the south. The potential for stream oriented recreation exists in long stretches of the main river, if a high quality of water can be provided. There are also several significant lakes in the basin that offer water-oriented recreation opportunities for much

of the present local demand. These lakes are Rushford covering 580 acres, Silver covering 760 acres, Conesus covering 3,250 acres and Honeoye covering 1,670. The lakes are nearly enveloped by private cottages although they do have public small boat launching facilities. There are two additional lakes, Hemlock covering 1,860 acres and Canadice covering 620 acres, that could offer natural recreation opportunities. They are managed under a virtual "hands-off" policy by the city of Rochester since they are part of the city's water supply. Investigations should be made into the possibility of cooperation with the city of Rochester to develop these two lakes for recreation.

190. Lakes Erie and Ontario were also considered for their recreation possibilities in serving the Genesee recreation market area. Recreation is presently restricted by varies stages of pollution in both lakes, but corrective measures are being taken which are expected to enhance their potential for water-oriented recreation in the future. Other restraints to major recreation development that were given serious consideration for Lake Ontario were the effect of low summer water temperatures on swimming and the roughness of the water for small boating a large percentage of the time.

191. FLOOD PLAIN ZONING

The Black Creek, Genesee River confluence in Monroe County, has experienced a steadily increasing amount of flood damage. Although several plans of improvement were considered in Appendix "F," Flood Control including channel widening and levees on both Black Creek and the Genesee River, no improvement plan could provide a greater amount of annual benefits than the corresponding annual cost of the considered project.

192. A realistic solution to the reduction of future flood damages in the Black Creek area would be for local authorities to prevent further construction of residential and/or commercial developments within the flood areas. In recent years there has been an increase by local governments in the use of flood plain regulation through zoning ordinances as a method of preventing future flood damages. Ideally flood plain regulation permits expensive development only in those areas which suffer no or very infrequent flooding and recommends the flood plain area for use as parks, recreation areas, wildlife reguges and other low damage developments.

193. The best solution to the increasing flood damages of the Black Creek-Genesee River area would be a flood plain information study that would enable the town of Chili officials to regulate the flood

plain. A general discussion of guide lines for flood plain regulations and flood proofing practices is given in the attachment to Appendix "F," Flood Control.

194. TECHNICAL ASSISTANCE

With minor flood damage spread in several locations throughout the basin, local officials should be appraised of the technical assistance available to them under the Flood Plain Management Program. This assistance could result in flood profiles at a given location for known floods and possible future floods. This would assist the local officials in their considerations for constructing schools, sewage treatment facilities, commercial buildings, farm structures and homes in areas near the Genesee River and/or tributary streams.

195. FLOOD WARNING AND FORECASTING SERVICES

There are many low lying farmland areas along the main stem of the Genesee River and several of its tributaries. These lands will remain in agricultural production. Thus flood warning is the best protective measure for the areas. This allows the farmer to move his machinery and cattle to higher land.

196. The U. S. Weather Bureau, Rochester, Airport Station, has established a flood forecasting system for broadcasting the warnings to the Basin residents by radio and television.

PROJECT FORMULATION

197. GENERAL

The five major reservoir sites and one local flood protection project selected in the preliminary analysis phase were given more detailed study including cost estimates for additional scales of development, subsurface investigations and estimates of benefits obtainable from multiple-purpose operations. The 101 upland reservoir sites selected in the preliminary analysis phase were more closely studies by the various agencies and task groups. Cost estimates and benefits were established for each site at the most desirable stage of development for the best use or combination of uses. The criteria followed for formulation was that described in preceding paragraphs number 155 to 161.

198. Economic studies were initially limited to the detail needed to establish best usage and potential feasibility. Angelica and Belfast sites were found economically unjustified based on tangible benefit evaluations for either single-purpose or multiple-purpose operation. Stannard and Tuscarora sites were found to be marginal as single-purpose recreation sites only. Portage site was shown to be economically justified as a multiple-purpose reservoir providing benefits primarily from recreation and pumped storage power, and with relatively minor benefits from improvement of water quality for the Genesee River between Avon and the Barge Canal. Location of sites shown in figure 39, and project descriptions, relevant data and estimates of cost may be found in Appendix "C." Dam and reservoir cost curves for the five sites considered are shown on figure 41.

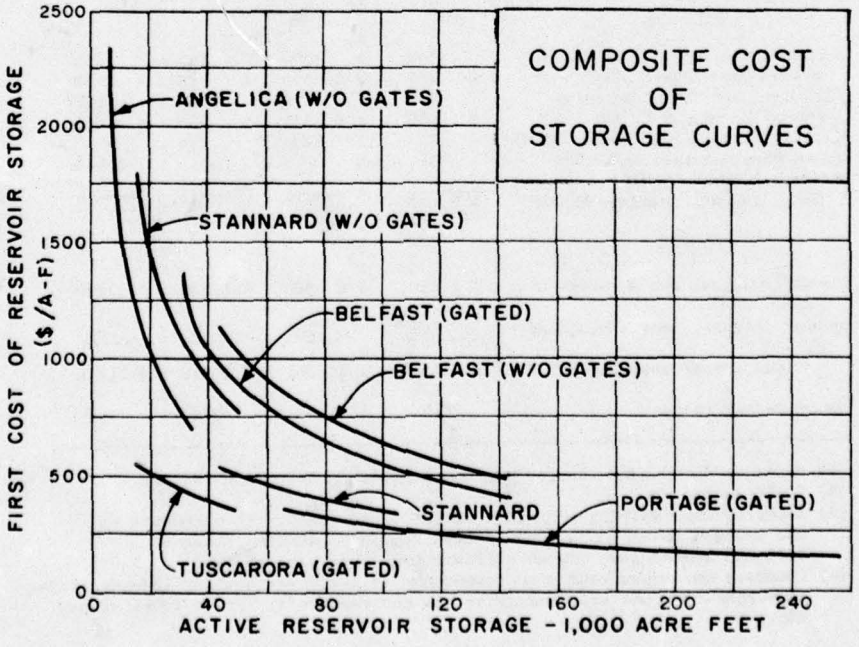


FIGURE 41

199. STANNARD RESERVOIR

The Stannard reservoir project, farthest upstream major site on the river, would be located 4 miles south of Wellsville, New York, controlling 168 square miles of drainage area. The structure, an earth dam with a concrete overflow spillway, would be approximately 2300 feet in length and varying from 76 to 97 feet in height, depending upon the scale of development.

200. Table 38 presents data on several of the plans of development considered for the reservoir and the average annual benefits that could be expected.

TABLE 38 - Stannard site, single and multiple-purpose plans

	Storage-inches on drainage area			
	5½"	5½"	9"	10½"
	Single-Purpose		Multiple-Purpose	
	Uncontrolled	Gated	Gated	Gated
Top of gates el.-ft.	-	1,598	1,614	1,620
Capacity-acre-ft.	-	49,000	81,000	93,000
Spillway crest el.-ft.	1,598	1,571	1,587	1.593
Capacity-acre-ft.	49,000	14,000	31,000	39,000
Min. recreation pool el.-ft.(1)	1,595	1,571	1,582	1,584
Max. recreation pool el.-ft.	1,598	1,598	-	-
Pool area-acres	1,700	1,700	1,200	1,280
Water quality storage-acre-ft.(2)	-	-	56,000	-
Water supply storage-acre-ft.(2)	-	-	-	66,000
Joint use pool el.-ft.	-	-	1,614	1,620
BENEFITS				
Recreation-1,000 visitor-days	340	340	155	155
Annual benefits-$1,000	$ 255	$ 255	$ 78	$ 78
Fishing-1,000 fisherman-days	170	170	120	128
Annual benefits-$1,000	$ 852	$ 852	$ 588	$ 630
Water quality benefits-$1,000(3)	-	-	315	-
Water supply benefits-$1,000	-	-	-	1,040
Power benefits-$1,000	-	-	$ 7	$ 7
Total annual benefits-$1,000	$ 1,107	$1,107	$ 988	$ 1,755
CHARGES				
Annual charges, dam & reser. - $1,000 (4)	$ 1,410	$ 880	$ 1,130	$ 1,190
Annual charges, recr.facilities - $1,000	161	161	86	86
Total annual charges-$1,000	$ 1,571	$1,041	$ 1,216	$ 1,276
Benefit-cost ratio	0.7	1.06	0.8	1.3

(1) Based on 6,000 acre-ft. for minimum dependable release of 20 cfs.
(2) Includes losses.
(3) Benefits from meeting a portion of the water quality requirements in the Genesee River below Court Street Dam in Rochester, based on a $500,000 annual cost for an effluent transport alternative.
(4) Interest and amortization on investment at 3-1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir. Price level of May 1967.

Flood control benefits, while the largest for any major sites considered, could provide an average annual total of only $31,000 in damage reduction downstream from the site. Storage for this purpose could not be justified. Also further study of this site for the single purpose of recreation is not within the scope of this report.

201. The multiple-purpose plan, 10½ inches of storage, using industrial water supply as a purpose, has a feasible benefit-cost ratio. This purpose was included at the request of the New York State Conservation Department representative on the formulation task group. Stannard would be the source of water for a possible wood pulp or paper processing plant on the Genesee River below Wellsville. There is no firm commitment that such a plant would be built and the industrial water demand would not constitute a basis for a recommendation under the criteria of this study. Stannard is being evaluated by the Water Development Committee for Appalachia using the above purpose. It appears that the Stannard Reservoir will be recommended by them.

202. BELFAST RESERVOIR

The project would consist of an earth dam, approximately 4900 feet in length, across the Genesee River and valley about 2-1/2 miles upstream from Belfast, New York and would control a drainage area of 578 square miles. The spillway would be a gated concrete gravity overflow section and, because of the great depth of overburden in the wide river valley at the site, would be located in an area excavated from the left valley wall to provide a rock foundation. The height of the dam for a multiple-purpose storage of 4-3/4 inches would be 110 feet.

203. Table 39 presents data for one plan of development considered for the reservoir and the average annual benefits that could be expected. Other scales of development providing 1-1/2 inches and 3 inches of storage for a gated reservoir and 2-1/2 inches of storage for an uncontrolled spillway were developed, but benefit-cost ratios were not as great as the plan shown below.

TABLE 39 - Belfast site multiple-purpose plan

Item	4-3/4" storage
Top of gates elevation - ft	1,370
Capacity - acre - ft	144,000
Spillway crest elevation - ft	1,340
Capacity - acre - ft	48,000
Water quality storage - acre - ft (1)	113,000
Min. recreational pool elevation - ft	1,332
Min. recreational pool area - acres	1,800
BENEFITS	
Recreation - visitor days	230,000
Annual benefits	$160,000
Fishing - fisherman - days	144,000
Annual benefits	$216,000
Water quality control benefits (2)	$638,000
Power benefits	$ 14,000
Total annual benefits	$1,028,000
CHARGES	
Annual charges, dam and reservoir (3)	$2,050,000
Annual charges, recreation facilities	$ 112,000
Total annual charges	$2,162,000
Benefit-cost ratio	0.5

(1) Includes losses
(2) Benefits from meeting the water quality requirements in the Genesee River at Avon, Gates-Chili-Ogden and below Court Street Dam in Rochester.
(3) Interest and amortization on investment at 3-1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir. Price level of October 1966.

204. Maximum potential flood control benefits of about $4,500 annually would not make provision of the necessary storage incrementally justified and no further consideration was given to this purpose. The power benefits could be credited for reduced pumping energy requirements at a downstream site, only, if Portage Reservoir was developed for hydroelectric power. Therefore, consideration of immediate basin needs capable of being met by Belfast reservoir indicated that economic feasibility would not result, further evaluation of the site was not made.

205. ANGELICA RESERVOIR

Angelica Creek, a tributary of the Genesee River, enters the river from the east at a point about 5 miles upstream from Belfast, New York. The reservoir site is on the creek about four miles above the confluence and one mile upstream from Angelica, New York. Drainage area at the site is 54 square miles. The structure would be an earth embankment about 3,900 feet in length with a maximum height of 130 feet and the concrete overflow spillway would be uncontrolled and located adjacent to the right bank to avoid the area of deep overburden in the stream valley.

206. Table 40 presents data on several of the plans of development considered for the reservoir and the average annual benefits that could be expected. The single-purpose recreation plans were developed since the recreation task group considered that scenic attractiveness of the area and proximity to Letchworth State Park would make it a high quality outdoor recreation site.

TABLE 40 - ANGELICA site, single and multiple-purpose plans

Item	Single-Purpose		Multiple-Purpose	
	Gated spillway 16" storage (1)	Uncontrolled spillway 10" storage (2)	Gated spillway 16" storage (1)	Uncontrolled spillway 10" storage (2)
Top of embankment elev. - ft	1,600	1,600	1,600	1,600
Top of gates elev. - ft	1,590	-	1,590	-
Capacity - acre ft	45,700	-	45,700	-
Spillway crest elev. - ft	1,574	1,574	1,574	1,574
Capacity - acre - ft	28,800	28,800	28,800	28,800
Water quality storage - acre - ft	4,000(3)	4,000(3)	16,900(3)	20,000(3)
Max. recreation pool elev. - ft	1,590	1,574	-	-
Pool area - acres	1,200	870	-	-
Min. recreation pool elev. - ft	1,587	1,569	1,574	1,540
Pool area - acres	1,140	790	870	320
BENEFITS				
Recreation - annual visitor-days	384,000	288,000	332,000	190,000
General recreation benefits	$ 288,000	$216,000	$ 249,000	$143,000
Fishing - annual fisherman-days	95,800	72,000	82,500	47,500
Fishing benefits	$ 505,000	$380,000	$ 435,000	$251,000
Water quality control benefits(4)	-	-	$ 92,000	$108,000
Total annual benefits	$ 793,000	$596,000	$ 776,000	$502,000
CHARGES				
Dam and reservoir - annual charges(5)	$ 930,000	$850,000	$ 930,000	$850,000
Recreation facilities-annual charges	$ 177,000	$134,000	179,000	134,000
Total annual charges	$1,107,000	$984,000	$1,109,000	$984,000
Benefit-cost ratio	0.7	0.6	0.7	0.5

(1) At top of gates
(2) At spillway crest
(3) For losses and 10 c.f.s. minimum release
(4) Benefits from meeting a portion of the water quality requirement in the Genesee River below Court Street Dam in Rochester, based on a $500,000 annual cost for an effluent transport alternative.
(5) Interest and amortization on investment at 3-1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir. Price level of October 1966.

207. This reservoir would afford some flood control protection to the village of Angelica, but the maximum potential benefits of $12,000 annually would not be incrementally justified for the storage required. Power benefits, contingent upon development of power at the Portage Reservoir on the Genesee River downstream from Angelica Creek would not be significant. In accordance with the considerations in paragraphs 155 to 157, neither municipal and industrial water supply nor irrigation water supply were found to constitute a basis for project authorization at this time. The results of the plans developed for Angelica Reservoir show it to be unfeasible at this time and no further evaluation was made for possible authorization.

208. TUSCARORA RESERVOIR

Keshequa Creek joins Canaseraga Creek near Sonyea, New York, at a point about four miles above the confluence of the latter stream with the Genesee River. Tuscarora Reservoir is located on Keshequa Creek about two miles above Sonyea. Drainage area at the site is 69 square miles. The dam would be a concrete structure about 800 feet in length with a maximum height of 145 feet and there would be a low rolled earth embankment about 500 feet in length at the left abutment. The spillway would be concrete founded on rock and controlled by crest gates. Although originally eliminated during preliminary studies because of limited potential for multiple-purpose use, relatively low cost per unit of storage and favorable evaluation for recreation and fishing usage indicated that further analysis should be undertaken.

209. Table 41 presents data for a single-purpose and multiple-purpose plan of development for a reservoir of 13 inches of storage and the average annual benefits that could be expected. A single-purpose and multiple-purpose plan was developed for 7-1/2 inches of storage and the benefit-cost ratio was found to be 0.9 and 0.8, respectively.

210. Considered for flood control, virtually all usable storage at the site would be required to realize significant damage reduction downstream and project justification could not be achieved for this purpose. However, it was considered desirable to include a minimum amount of flood control storage in any plan for regulation of frequent small floods in the interest of downstream fisheries and the Canaseraga project. The multiple-purpose development of Tuscarora Reservoir is seen to be economically unfeasible at this time and more detailed evaluation is not indicated. A project oriented primarily to recreational development is seen to be marginal, but further evaluation would only be appropriate for an agency or level of government authorized to undertake projects of this nature.

TABLE 41 - Tuscarora Reservoir; single and multiple-purpose plans

	13" Total Storage (1)	
	Single-purpose	Multiple-purpose
Top of embankment elev. - ft.	820	820
Top of gates elev. - ft.	810	810
Capacity - acre-ft.	46,000	46,000
Spillway crest elev. - ft.	784	784
Flood control storage - acre-ft.	4,000	4,000
Top of joint-use pool elev. - ft.	-	806
Low flow storage - acre-ft.	4,000 (2)	22,000 (3)
Max. recreation pool elev. - ft.	806	806
Capacity - acre-ft.	42,000	42,000
Pool area - acres	940	940
Min. recreation pool elev. - ft.	802	778
Capacity - acre-ft.	38,000	20,000
Pool area - acres	900	580
BENEFITS		
Flood control annual benefits	$ 2,000	$ 2,000
Water quality control annual benefits (4)	-	$ 98,000
Recreation attendance - annual visitor-days	290,000	243,000
General recreation benefits	$218,000	$182,000
Fishing attendance - annual fisherman-days	92,000	60,000
Fishing benefits	$496,000	$318,000
Total annual benefits	$716,000	$600,000
CHARGES		
Dam and reservoir-annual charges (5)	$590,000	$590,000
Recreation facilities-annual charges	$136,000	$114,000
Total annual charges	$726,000	$704,000
Benefit-cost ratio	0.99	0.85

(1) Storage below top of gates.
(2) Storage for minimum reservoir release plus losses.
(3) Storage for water quality control and minimum reservoir releases plus losses.
(4) Benefits from meeting a portion of the water quality requirements in the Genesee River below Court Street Dam in Rochester, based on a $500,000 annual cost for an effluent transport alternative.
(5) Interest and amortization on investment at 3-1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir. Price level of March 1967.

211. PORTAGE RESERVOIR

The Portage Reservoir project was the largest reservoir considered and the key project in any system of reservoirs investigated. The reservoir would be created by a concrete gravity dam across a restrictive section of the Genesee River at Portageville, New York and approximately 2-1/2 miles above the point reached by a full pool at the existing Mount Morris Reservoir. The dam would be 745 feet in length and 115 feet in height with a gated overflow spillway. The drainage area at the site is 985 square miles at maximum scale considered, the reservoir full pool would be 17 miles long and would contain 283,000 acre-feet of storage, equivalent to about 5-1/2 inches of runoff on the drainage area.

212. The Portage site was considered by all the task groups as having the best possibilities for multiple-purpose development. A massive recreational development was recommended by the recreation task group and the fish and wildlife task group estimated potential annual visitation to be highest of any site in the basin. Pumped storage hydroelectric power development was indicated to be economically feasible by the power task group. The project could also provide flow augmentation for water quality improvement in Genesee River reaches below Avon, below the Gates-Chili-Ogden sewage treatment plant above the Barge Canal, and below the Eastman Kodak Company outfall in Rochester, all are discussed in Appendix "H." Water for supplemental irrigation of Ontario Lake Plain lands, to be delivered via the Genesee River and Barge Canal was cited as a potential for the site by the agricultural task group. Municipal and industrial water supply for metropolitan Rochester, to be taken from the river near Avon, was suggested for consideration by the New York State Conservation Department but was not recommended for study by the water supply task group.

213. Comparison of potential benefits and costs derived for the preliminary analysis showed that maximum net benefits would be obtained from a multiple-purpose plan based primarily upon recreation and hydroelectric power with secondary consideration only for water quality, generally resolvable by more economical means than storage. Although power studies were essentially single-purpose oriented, recreation requirements, minimum releases for the falls in Letchworth State Park, and scenic values in the park are fully recognized. Therefore, the operating plan developed in the power appendix involved conversion of a portion of Mount Morris reservoir flood control storage to a joint-use permanent pool for power and recreation, with a consequent transfer of flood control storage to Portage reservoir, and was used as the basis for final formulation of a multiple-purpose project at Portage.

214. Design and cost data were prepared for three scales of development, 2 inches, 3-1/2 inches and 5-1/2 inches of storage. The smaller scale reservoirs could not provide the flood control storage required to be transferred from Mount Morris reservoir and were used primarily as indices of cost for single-purpose alternative projects in derivations of benefits. A reduction in storage from the 5-1/2 inch capacity reservoir would reduce the head available for power, would reduce normal and minimum recreation pool areas, and would increase pool fluctuations during high-flow and low-flow periods. For operating plans considered, a reservoir with slightly less than 5 inches of capacity would be necessary in the critical year of record to assure that a usable pool could be maintained above the estimated 100-year sediment storage pool and still meet downstream flow commitments. Incremental savings possible in dam and reservoir costs for any practical degree of reduced storage below 5-1/2 inches were not considered to warrant further refinement of the project scale in a survey scope study. There were four power plans investigated by the power task group. Plan C, a reversible pump storage plan, was the only plan that had a comparability ratio of unity. Therefore, controlling elevations established in power plan C of Appendix "L" were used for the multiple-purpose development of Portage.

215. Several plans of operation were considered. The basic plan of operation included a normal joint-use pool for recreation and power, a minimum release of 225 cfs during daylight hours (equivalent to a mean daily discharge of about 170 cfs) for the falls in Letchworth Park, a lower pool in Mt. Morris reservoir at elevation 697 feet for recreation and pumped storage power operations, and replacement flood control storage in Portage reservoir for equivalent storage lost in Mt. Morris reservoir by creation of the permanent pool. Flow diversion for power would enter an intake structure located in the Portage pool above the dam and would be conveyed by tunnel to an underground powerhouse excavated in rock. A tailrace tunnel would extend from the powerhouse to the Mt. Morris pool. Reversible pump-turbine units in the powerhouse would allow pump-back operation from Mt. Morris reservoir into Portage reservoir during off-peak hours. Minimum release to the lower river of 160 cfs from Mt. Morris Dam would be approximately equivalent to the 170 cfs release from Portage project, less losses, and the result would be a normal daily Mt. Morris pool fluctuation of less than two feet from power operations. After 1 October each year, Portage reservoir would be drawn below normal summer pool to reduce pumping energy requirements. The basic operating plan was modified into four plans providing additional releases upon demand, or continuously, depending on objectives. These operating plans and purposes are shown on figure 42.

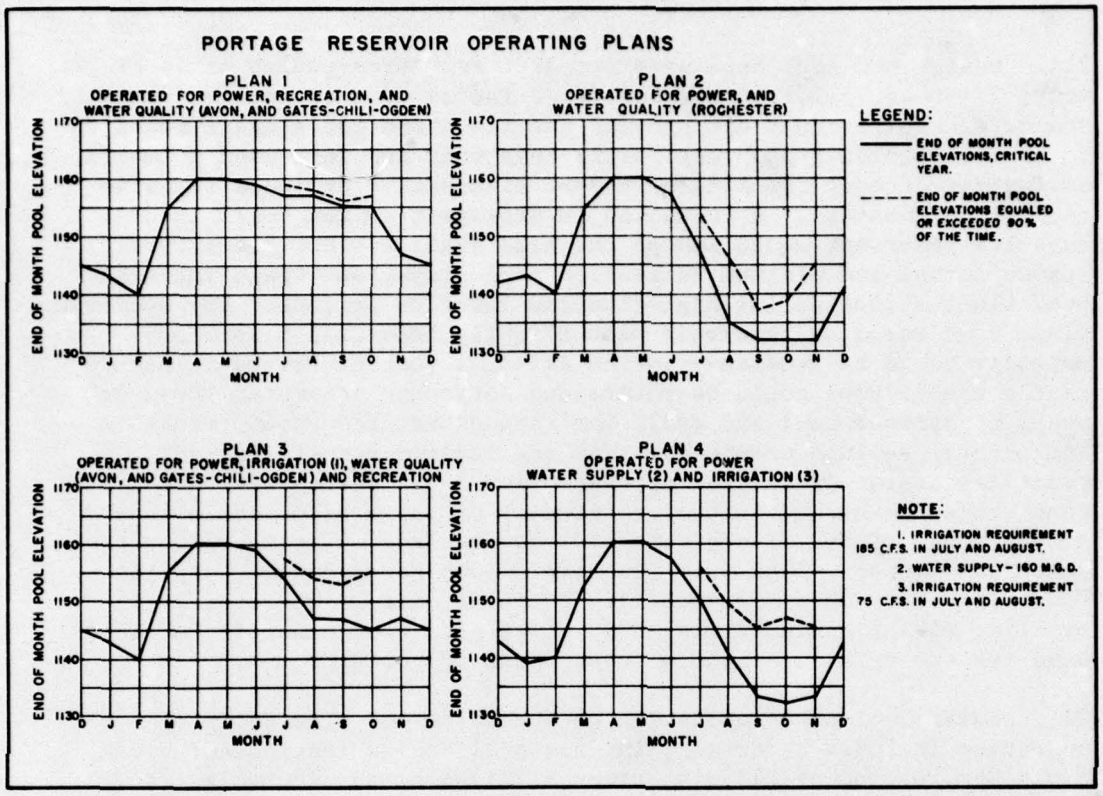


FIGURE 42

216. The duration and severity of drawdown in plans 2 and 4 were judged by the outdoor recreation task group to be so adverse for recreational purposes that only minimum development would be undertaken and the loss in annual benefits, net of costs of facilities, was estimated at $989,000 based on recreational development proposed for plan 1. Plan 2, which could provide total gross benefits for water quality of $656,000 based on the cost of advanced treatment or waste diversion alternatives for the three river reaches requiring improvement, would therefore produce less net benefits than plan 1. Plan 4, while found capable of providing dependable water supply of 160 mgd at a cost approximately equal to that for the alternative Lake Ontario source, would draw this water from the Genesee River at Avon, New York, and return flows would be discharged to Lake Ontario in Rochester disposal system outfalls. The diversion would be equivalent to a consumptive loss of 160 mgd for the lower river from Avon to Lake Ontario. This factor, together with the adverse opinion of the recreation task group and the judgement of the water supply task group that metropolitan Rochester would utilize Lake Ontario in preference to other sources, led to the conclusion that

study of plan 4 should be terminated without further evaluation. Plan 3 would be essentially the same as plan 1 with additional releases of 185 cfs made during the months of July and August for irrigation. This water would be withdrawn from the Barge Canal for application to lands in the Ontario Lake Plain and replaced by Genesee River flows into the canal pool above Court Street Dam in Rochester.

217. Table 42 presents data for the multiple-purpose plan considered the most feasible for Portage Reservoir. The data are for 5-1/2 inches of storage, power plan C and operating plan 1, as shown on figure 42. Additional data and discussion of items shown in table 42 can be found in Appendix "B".

TABLE 42 - Portage site, multiple-purpose plan

Top of gates - elev., ft.		1,190	
Capacity - acre-ft.		283,000	
Spillway crest - elev., ft.		1,160	
Capacity - acre-ft.		124,000	
Sediment pool - acre-ft.		31,000	
Minimum recreation pool - elev., ft.		1,155	
Maximum recreation pool - elev., ft.		1,160	
Pool area - acres		4,100	
Maximum gross head for power, ft.		464	
Average gross head for power, ft.		460	
Installed capacity, KW		200,000	
Average annual energy, MWH		412,400	
Average annual pumping energy, MWH		209,200	
BENEFITS			
Power: At-site (capacity)		$3,800,000	
(energy)		$ 949,000	
Downstream (energy)(1)		$ 17,000	
Total power -			$4,766,000
Recreation: At-site- visitor-days(2)		2,000,000	
benefits-(3)		$2,600,000	
Downstream- visitor-days(4)		85,000	
benefits		$ 89,000	
Fishing: visitor-days		400,000	
benefits		$ 275,000	
Total recreation			$2,964,000
Water Quality: (5)			$ 138,000
Total Average Annual Benefits			$7,868,000
COSTS(6)			
First Costs:			
Lands and damages		$ 4,840,000	
Dam and reservoir		$32,800,000	
Power facilities		$44,500,000 (7)	
Recreation facilities		$ 8,865,000 (8)	
Total		$91,005,000	
Interest during construction		$ 5,795,000	
Total Investment		$96,800,000	
Annual Charges:			
Interest (3-1/4 percent)		$3,146,000	
Amortization (100-year life)		$ 134,000	
Operation and maintenance		$1,481,000	
Major replacements		$ 189,000	
Administration and general(power)		$ 162,000	
Pumping energy		$ 628,000	
Total Annual Charges			$5,740,000
Benefit-cost ratio			1.4

(1) Benefits from re-regulated flows at 4 existing hydroelectric plants.
(2) Initial visitation 1,400,000, 40 year growth period to 2,000,000 visitor-days.
(3) Discounted at 3-1/4 percent for straight line growth over 40 years in 100-year life.
(4) Visitation at Mount Morris Reservoir for canoeing and cruise boating.
(5) Benefits from the Avon and Gates-Chili-Ogden reaches.
(6) Price level of March 1967.
(7) Power plan C, Appendix "L."
(8) Discounted at 3-1/4 percent for uniform expenditure in 40-year growth period.

Thus Portage Reservoir has a favorable benefit-cost ratio and the power plan has a comparability ratio of unity. Therefore, the multiple-purpose project meets the study criteria for final consideration in the recommended basin plan for meeting basin needs.

218. CANASERAGA PROJECT

Canaseraga Creek is the largest tributary of the Genesee River with a drainage area of 335 square miles at the mouth. It is located in the Lower Genesee Basin and joins the Genesee River about 4 miles downstream of Mount Morris Dam. The upper reaches of the Canaseraga are steep and rugged. The lower reach is a flat alluvial agricultural plain approximately fifteen miles in length and from one to three miles in width. This lower reach is inundated to some extent annually by streamflow exceeding the channel capacity and poor local drainage. This poorly drained area provides temporary habitat for thousands of waterfowl during their spring and fall migration periods. Flood damages in the valley are agricultural in nature and inundation has been known to last for several months. The proposed project is described in survey scope detail in Part IV, Appendix "C," Project Designs and Cost Estimates.

219. Several alternative plans of development were considered. These alternative plans are listed in paragraph 179. The plan consisting of channel improvement with a barrier levee for both 5-year and 10-year flood protection was investigated. The 5-year multiple-purpose project provided the best benefit-cost ratio. The basis of design for this plan of improvement is as follows:

a. Protect the Canaseraga Valley from Shakers Crossing upstream to White Bridge from flooding from the 5-year discharge on the "summer event" basis;

b. Sufficiently reduce the duration of flooding in the existing ponding area upstream of Keshequa Creek to assure the farmers use of this land by a certain date a percentage of the years;

c. Provide a control at the lower end of the improvement to limit the discharge from the valley to that discharge that would have occurred under existing conditions and thereby produce no greater damage on the lower Genesee Basin due to discharge from Canaseraga Creek than would have occurred under existing conditions; and

d. Provide both permanent ponding areas and a temporary spring ponding area for waterfowl habitat, so that the existing habitat conditions will be improved by the project.

220. The average annual benefits and costs that can be expected to accrue from both a single and multiple-purpose project affording 5-year protection as described above, are given in table 43.

TABLE 43 - Canaseraga project, single and multiple-purpose plans

Item	Single Purpose Project: Flood Control	Single Purpose Project: Fish & Wildlife	Multiple-Purpose Project
Channel improvement, ft.	88,000	-	88,000
Retention structure, length			
Non-overflow section, ft.	9,000	-	9,000
Earth overflow section, ft.	3,500	-	3,500
Gated spillway, ft.	75	-	75
Average height, ft.	17	-	17
New bridges			
Highway	2	-	2
Farm	3	-	3
Weirs & Control structures	5	-	5
Waterfowl ponds			
2 Permanent, surface, Ac.	-	1,140	1,140
1 Temporary, surface, Ac.	-	2,000	2,000
BENEFITS			
Flood control:			
Reduction of flood losses	$ 54,900	-	$ 54,900
Changed land use	$ 33,700	-	$ 33,700
More intensive land use	$ 106,300	-	$ 106,300
Fish and Wildlife:			
Waterfowl habitat improvement (1)	-	$ 171,200	$ 171,200
Bird-watching & waterfowl hunting(1)	-	$ 26,700	$ 26,700
Total Average Annual Benefits	$ 194,900	$ 197,900	$ 392,800
COSTS			
First cost	$ 6,520,000	$3,740,000	$ 7,466,000
Interest during Construction (3-1/8%)	$ 203,800	$ 116,900	$ 233,300
Investment cost	$ 6,723,800	$3,856,900	$ 7,699,300
Annual Charges:			
Interest (3-1/8%)	$ 210,100	$ 120,500	$ 240,600
Amortization (50-years)	$ 57,400	$ 32,900	$ 65,800
Operation and maintenance	$ 21,700	$ 8,600	$ 23,700
Total Annual Charges	$ 289,200	$ 162,000	$ 330,100
Benefit-Cost Ratio	0.7	1.2	1.2

(1) Discounted at 3-1/8% for ultimate use, expected to develop within 20 years after completion of project.

221. The multiple-purpose plan of improvement for Canaseraga Valley is economically justifiable and provides for more needs than a single-purpose fish and wildlife project. The plan provides a feasible solution to the outstanding remaining flood problem in the Genesee River Basin and would also produce sizable additional benefits attributable to fish and wildlife interests.

222. UPLAND RESERVOIRS

Of the 226 structural possibilities investigated in the Genesee River Basin, 33 are proposed for construction. These include two reservoir sites which will provide a measure of flood control and three which will store water for irrigation in the Basin proper. An additional 29 sites are potentially capable of supplying irrigation water in the Ontario Lake Plain Service Area. In total, these irrigation sites will provide water sufficient to irrigate an estimated 15,400 acres of vegetable crop.

223. Flood prevention: Various structural measures were investigated to alleviate flooding conditions at noted damage areas, table 13. These structural measures included both flood retarding reservoirs and channel improvement where appropriate. A total of 31 sites in the Genesee River Basin would give some degree of flood prevention benefits but are too costly to be justified for flood prevention alone.

224. Irrigation: A total of five sites in three watershed areas appear feasible to provide water for irrigation in the Genesee River Basin. Two of these sites can be excluded since they duplicate areas irrigated from the other sites. The beneficial storage provided by each site is proportional to the number of acres available to irrigate from that particular structure. Multiple-purpose use of an irrigation reservoir is limited due to the wide fluctuation of the water level. This fluctuation is not conducive to such uses as recreation or fish and wildlife habitat. However, such sites could be constructed to provide additional storage for other water supply needs.

225. Only three watersheds were involved in the final determination of feasible irrigation structures in the basin as shown on table 44. In all of them one site was sufficient to supply irrigation water to the majority of the irrigable acreage although alternative sites were available in each. Similarly, each site offered considerable low-cost extra storage beyond that necessary for irrigation. These watersheds which offer irrigation water storage present opportunities for development under the Watershed Protection and Flood Prevention Act, Public Law 566. The three sites selected were 11-2, 17-19 and 19-7.

TABLE 44 - Reservoir sites to meet 1980 basin irrigation needs

Site no.	Drainage Area (sq. mi.)	Storage (ac.-ft.) (1)	Height of Dam (ft.) (1)	Ave. Ann. Cost (2)	Ave. Ann. Benefits (2)	Benefit-cost ratio
11-2	11.7	3,820	42	$ 14,800	$ 36,400	2.5
17-19	7.5	4,030	32	17,700	22,100	1.2
17-21	2.4	320	14	10,200	10,200	1.0
19-4	0.6	102	13	2,200	3,300	1.5
19-7	6.5	2,435	37	23,600	18,200	0.8

(1) Storage and dam height is for multiple-purpose structure.
(2) Values are for the single-purpose of irrigation.

226. In the Ontario Lake Plain Service Area a total of 29 irrigation systems capable of supplying water to about 13,000 acres of land which would more than satisfy the 1980 needs were found to have a favorable - cost ratios. Table 45 shows the recommended sites.

TABLE 45 - Reservoir sites to meet 1980 Ontario Lake Plain irrigation needs

Site No.	Drainage area (sq. mi.)	Storage (ac. ft.)	Height of dam (ft.)	Average annual cost	Average annual benefits	Benefit-cost ratio(2)
B-2	0.4	204	19	$ 3,400	$ 4,200	1.2
B-7	1.0	300	14	5,800	6,500	1.1
B-9	0.3	190	12	4,100	4,100	1.0
B-17	1.4	340	12	6,000	7,400	1.2
B-20A	1.7	513	21	10,800	11,100	1.0
B-21	1.6	540	18	9,100	11,700	1.3
B-24(1)	0.8	230	14	6,700	5,000	0.8
C-3	19.9	780	36	19,400	16,900	0.9
C-4	1.1	324	30	4,300	7,000	1.6
C-8A(1)	0.8	519	20	10,700	11,200	1.1
C-11(1)	2,9	604	33	12,900	13,100	1.0
C-12	5.2	300	13	8,000	6,500	0.8
C-13(1)	1.0	216	14	8,100	8,100	1.0
D-2(1)	9.7	1,780	24	22,900	38,600	1.7
D-4(1)	4.7	800	20	12,500	17,300	1.4
D-6	1.7	152	24	3,900	3,300	0.9
D-7	6.4	267	21	4,300	5,800	1.4
D-8(1)	1.1	332	23	7,100	7,200	1.0
D-12	1.1	372	16	5,600	8,100	1.4
E-4	10.2	520	27	8,000	11,300	1.4
E-6	6.2	387	29	11,000	8,400	0.8
E-19	11.5	800	15	13,700	17,300	1.3
E-20	Oak Orchard Creek	400	15	6,800	8,700	1.3
F-5	2.3	173	20	3,200	3,800	1.2
F-6	2.6	400	15	9,300	8,700	0.9
G-3	1.1	384	25	3,900	8,300	2.1
G-4	2.5	278	25	5,000	6,000	1.2
G-6	3.6	500	18	6,300	10,800	1.7
G-12A(1)	1.5	376	29	7,900	8,200	1.0

(1) Irrigation system with channels and/or external distribution system.
(2) Sites listed as having an unfavorable benefit-cost ratio may have a favorable ratio when a more detailed benefit evaluation is made.

227. Fish and Wildlife: The projected needs of the fish and wildlife resource of the Basin are developed in Appendix "N". These needs are shown in terms of projected annual use-days by decade. From the list of potential sites determined by the Agricultural Task Group, those sites feasible for fish and wildlife habitat were indicated for further study. These preliminary selections were designed, costs were estimated and tentative benefits determined. Then, formulation of the plan was based upon the economic feasibility of the site and its potential for helping to meet the need of the future.

228. In total, 24 impoundment sites were included in the plan for fish and wildlife development as shown in table 46. Eight of these sites will serve a second primary purpose of recreation and three are irrigation sites one of which will also supply augmentation water to a trout stream. It should be noted that the majority of the sites in the Basin will provide fish and wildlife benefits incidental to some primary purpose.

229. While not strictly part of the agricultural resource, these developments provide large increases in rural wealth through increases in commercial activity, greater opportunity for the rural labor force, increased value of farms and rural property and in recreational opportunity for rural residents.

TABLE 46 - Reservoir sites to meet 1980 fish and wildlife needs

Site No.	Drainage Area (sq. mi.)	Surface Acres	Height of Dam	Ave. Ann. Cost (1)	Ave. Ann. Benefits (2)	Benefit-cost ratio	Other Uses (3)
1 - 5:	19.5	110	102	$ 94,400	$77,900	0.8 (4)	Rec, FP(5)
3 - 1:	23.7	216	102	68,800	83,600	1.2	-
3 - 4:	10.4	156	65	112,700	117,900	1.1	Rec
5 - 1:	19.6	138	87	49,400	62,900	1.3	Rec. (5)
5 - 21:	1.6	86	59	21,700	45,900	2.1	-
7 - 1:	17.6	127	65	25,100	48,000	1.9	-
7 - 2:	15.7	1,715	50	157,100	604,800	3.8	Rec (6)
8 - 13:	2.8	227	39	39,500	130,000	3.3	Rec
9 - 3:	6.7	72	77	31,100	20,400	0.7 (4)	-
10 - 3:	2.7	122	39	11,800	46,000	3.9	-
11 - 2:	11.7	-	42	17,600	167,600	9.5	I
11 - 4:	1.8	92	53	19,400	34,000	1.8	-
13 - 1:	5.0	60	119	33,400	35,500	1.1	-
13 - 6:	16.3	243	47	86,300	180,800	2.1	Rec
13 - 22:	19.1	94	85	36,700	34,800	1.0	-
14 - 5:	2.2	90	89	24,000	48,700	2.0	-
15 - 2:	10.0	720	31	57,600	72,000	1.3	Rec
17 - 1:	2.7	202	48	35,900	80,400	2.2	-
17 - 7:	12.6	124	142	45,100	46,800	1.0	FP
17 - 8:	2.1	215	66	23,200	59,000	2.5	-
17 - 12:	17.0	500	46	32,600	145,200	4.5	WQ
17 - 19:	7.5	-	32	31,500	121,500	3.9	I
17 - 24:	3.1	258	44	62,400	141,200	2.3	Rec
19 - 7:	6.5	-	37	34,100	58,200	1.7	I

(1) Column contains cost of facilities in accordance with data provided in Appendix "N", Fish & Wildlife, dated May 1969

(2) Column contains Fish and Wildlife benefits in accordance with Appendix "N", dated May 1969 plus benefits from other sources.

(3) Rec - recreation; I - irrigation: FP - minor flood prevention possibilities; WQ - water quality

(4) This site was recommended without consideration for its benefit - cost ratio. It is expected that a detailed evaluation of all benefits accruing to site may result in a favorable benefit - cost ratio.

(5) Originally considered as a single-purpose recreation site.

(6) Data in columns, "surface acres" and "height of dam" are given for pool elevation of 1711, an elevation of 1705 would be preferred for maximum waterfowl habitat values.

230. Recreation: Sites recommended for recreation development and use are those recommended in Appendix "M," Recreation. The formulation procedure followed for recreation was quite similar to that followed for selection of Fish and Wildlife sites, in that all sites were screened for physical and economic feasibility first and then chosen on their ability to meet a total projected recreation need. A total of 13 recreation sites are recommended and are shown in table 47.

231. Factors affecting the structural selection include the availability of access, fluctuation and size of water surface, characteristics of surrounding terrain and vegetation, dependability of water yield, geologic conditions and the presence of alternate or complementary uses.

TABLE 47 - Reservoir sites to meet 1980 recreation needs

Site No.	Drainage Area (sq. mi.)	Surface Acres	Height of Dam (ft.)	Ave. Ann. Cost	Ave. Ann. Benefits (1)	Benefit-cost ratio	Other Uses
1 - 5:	19.5	110	102	$ 94,400	$ 77.900:	0.8(2)	FP, FW (3)
3 - 4:	10.4	156	65	112,700	117,900:	1.1	FW
5 - 1:	19.6	138	87	49,400	62,900:	1.3	FW (3)
7 - 2:	15.7	1,715	50	157,100	604,800:	3.8	FW (4)
8 - 13:	2.8	227	39	39,500	130,000:	3.3	FW
10 - 2:	0.9	52	36	18,500	20,000:	1.1	
10 - 14:	1.0	40	35	18,400	22,500:	1.2	
13 - 6:	16.3	243	47	86,300	180,800:	2.1	FW
15 - 2:	10.0	720	31	57,600	72,000:	1.3	FW
16 - 2:	6.6	180	20	30,900	36,500:	1.2	
17 - 24:	3.1	258	44	62,400	141,200:	2.3	FW
19 - 11:	3.3	315	18	420,000	675,000:	1.6	
20 - 2:	1.3	140	18	284,100	450,000:	1.6	

(1) Benefits are based primarily upon Recreation Use except for sites 5-1, 7-2, 8-13, & 13-6, which derive a significant portion of their benefits from Fish and Wildlife use.
(2) This site was recommended without consideration for its benefit-cost ratio. It is expected that a detailed evaluation of all benefits accruing to site may result in a favorable benefit-cost ratio.
(3) Originally considered as a single-purpose recreation site.
(4) Data in columns, "surface acres" and "height of dam" are given for pool elevation of 1711, an elevation of 1705 would be preferred for maximum waterfowl habitat values.

232. Water Supply: Task Group 4 determined projected water supply needs by municipal and industrial water users in the Genesee River Basin. An inventory of sites potentially capable of supplying this water was then made. Of eleven possible sites, seven were tentatively selected in this process. In a subsequent screening based on cost, ground water availability, and local interests, this list was reduced to one site, 18-7 as shown in table 48. This structure would supply water for the village of Warsaw which has expressed its need for and interest in the site.

TABLE 48 - Reservoir site to meet 1980 municipal water supply needs

Site No.	Drainage Area (sq. mi.)	Beneficial Storage (A-Ft.)	Surface Area Beneficial Pool (Acres)	Ave. annual cost	Ave. annual cost per (A-Ft.)
18-7	2.9	700	45	$ 16,300	$ 23.60

233. Water Quality Management: From projected low flow needs and preliminary site inventories, it was possible to locate sites which had a yield great enough to supply supplemental water for water quality management. The economic feasibility of these sites was determined by estimating the annual alternative cost of advance treatment and comparing this with the annual cost of constructing, maintaining and operating the potential site. Where the annual cost of augmentation was less than the alternate cost of treatment, the site was determined to be feasible. The recommended sites are shown in table 49.

TABLE 49 - Reservoir sites to meet 1980 water quality control needs

Site No.	Drainage Area (Sq. Mi.)	Beneficial Storage (Ac. Ft.)	Average Release Provided (CFS)	Ave. annual cost(1)	Ave. annual benefits(2)	Benefit-cost ratio	Problem area
13-27	0.8	230	0.23	$ 9,200	$ 13,500	1.5	Mills Cr. below Wayland
16-7	0.7	328	0.35	5,300	10,000	1.9	Wilkins Cr. below Livonia
17-12	17.0	6,660	3.70	23,200	19,800	.9(3)	Honeoye Cr. below Honeoye Falls
18-2	2.4	1,488	1.30	10,400	37,500	3.6	Oatka Cr. below Warsaw

(1) Average annual cost is for the single-purpose of water quality control.
(2) Limited to minimum alternative cost of advance treatment facilities.
(3) Evaluation of additional benefits in detailed planning stage could perhaps justify this site.

BASIN PLAN

234. PROCEDURE FOR FORMULATION

Because of the study schedule and funding arrangements, preliminary analysis of potentially beneficial projects was initiated concurrently with studies for identifying and quantifying the basin's problems and needs. In cooperation with other agencies participating in the appropriate task groups, sites for potential reservoirs on the river and major tributaries were identified and studied by the Corps of Engineers. Upland reservoir sites were similarly investigated by the Soil Conservation Service, U. S. Department of Agriculture. Data from previous studies, and input supplied by other task groups as the study progressed, were used for initial screening of sites. In the screening process, sites with the greatest potential for meeting indicated needs were selected for more detailed evaluation. Resource problems resolvable by means other than reservoir storage were identified and analyzed by the particular task groups concerned.

235. EARLY-ACTION PLAN

The basin plan which was developed by the Plan Formulation Task Group and presented to the residents of the basin at two public hearings in October 1967 is shown on figure 43. This plan, an early-action plan, was essentially the combination of the best proposed plans that were submitted by the various special task groups, regardless of existing federal authority to construct. The one deficiency as seen by some members of the Coordinating Committee was that insufficient funds, personnel restraints and deadline dates did not allow for all reasonable alternative plans and/or possible combinations of plans features to be presented at the public hearings.

236. The basin plan as presented in Appendix "B" and at the October 1967 public hearings consisted of the following early-action features:

a. Multiple-purpose Portage Reservoir Project for recreation, power and low flow augmentation.

b. Multiple-purpose Canaseraga Valley Project for local flood control and waterfowl habitat improvement.

c. 35 upland reservoirs for various purposes.

d. Land treatment program

e. Flood Plain Management program for Black Creek, Monroe County.

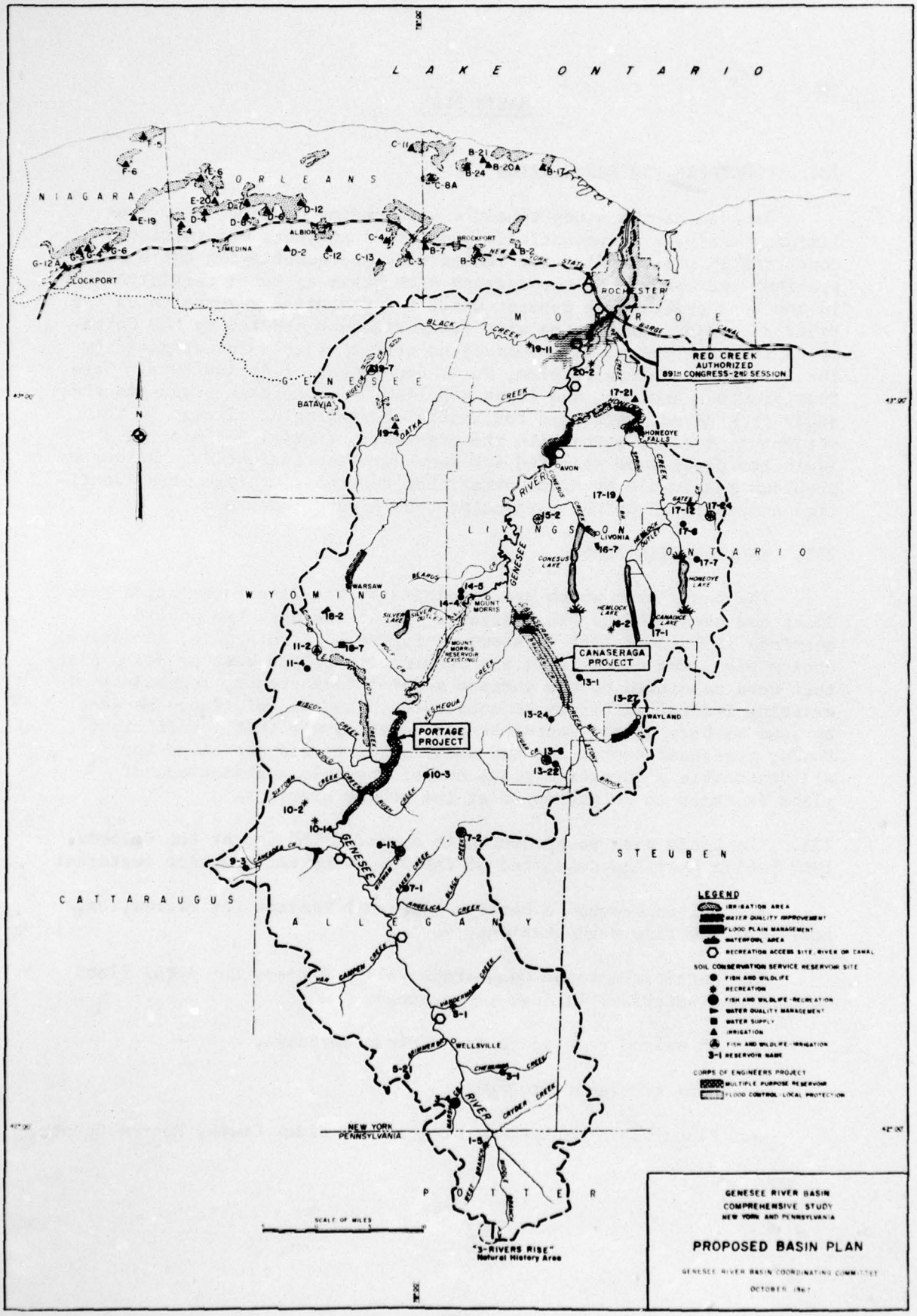

LAKE ONTARIO
NIAGARA
ORLEANS
MONROE
GENESEE
LIVINGSTON
ONTARIO
WYOMING
STEUBEN
CATTARAUGUS
ALLEGANY
POTTER
LOCKPORT
MEDINA
ALBION
BROCKPORT
ROCHESTER
BATAVIA
AVON
HONEOYE FALLS
LIVONIA
WARSAW
MOUNT MORRIS
WAYLAND
WELLSVILLE
RED CREEK
AUTHORIZED
89TH CONGRESS-2ND SESSION
CANASERAGA PROJECT
PORTAGE PROJECT
NEW YORK
PENNSYLVANIA
"3-RIVERS RISE"
Natural History Area
SCALE OF MILES
LEGEND
IRRIGATION AREA
WATER QUALITY IMPROVEMENT
FLOOD PLAIN MANAGEMENT
WATERFOWL AREA
RECREATION ACCESS SITE, RIVER OR CANAL
SOIL CONSERVATION SERVICE RESERVOIR SITE
FISH AND WILDLIFE
RECREATION
FISH AND WILDLIFE-RECREATION
WATER QUALITY MANAGEMENT
WATER SUPPLY
IRRIGATION
FISH AND WILDLIFE-IRRIGATION
3-1 RESERVOIR NAME
CORPS OF ENGINEERS PROJECT
MULTIPLE PURPOSE RESERVOIR
FLOOD CONTROL-LOCAL PROTECTION
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
PROPOSED BASIN PLAN
GENESEE RIVER BASIN COORDINATING COMMITTEE
OCTOBER 1967

FIGURE 43

f. 8 Recreation Access sites on the Genesee River and Barge Canal.

g. "3-River Rise," Natural History Area.

h. Conesus Lake Waterfowl Area.

i. Honeoye Lake Waterfowl Area.

j. 29 Soil Conservation Service reservoirs for irrigation in the Ontario Lake Plain.

237. LONG RANGE PLAN

A long range or framework plan was developed by the Plan Formulation Task Group. This long range plan was not presented at the October 1967 public hearings, but it does incorporate some of the comments voiced at the public hearings. The long range plan should serve as a guide for the orderly future development of the water and related land resources of the Basin. Although the projects are not presently economically justified, they would help to satisfy a portion of the remaining projected needs of the basin.

238. The long range plan as presented on plate 2 consists of the following features:

a. Tuscarora Reservoir, consisting of a concrete gravity dam with a maximum height of 145 feet, a potential storage of 46,000 acre-feet and approximately 1,000 surface acres at full pool. This reservoir would have a multiple-purpose potential for flood control, water supply, water quality management, irrigation, fish and wildlife and water-oriented recreation. It's greatest potential appears to be as a single-purpose recreation reservoir for both water-oriented recreation and fishing. The reservoir singly or in combination with Wiscoy Reservoir offers a possibility for a recreation complex with Letchworth State Park as an alternative to the Portage Project;

b. Wiscoy Reservoir, consisting of a rolled earth dam, a concrete spillway section 160 feet in height, a potential storage of 43,200 acre-feet and 900 surface acres at full pool. This reservoir would have a multiple-purpose potential for flood control, irrigation, hydroelectric power, fish and wildlife and water-oriented recreation. It's greatest potential appears to be as a single-purpose recreation reservoir in conjunction with Tuscarora Reservoir;

c. Oatka Reservoir, consisting of a rolled earth dam, a concrete spillway section 110 in height, a potential storage of 44,500 acre-feet and approximately 860 surface acres at full pool. This reservoir

appears to possess an excellent potential for intensively-developed day use recreation. It is in close proximity to the major metropolitan area of the basin, Rochester. It is presently not economically justified, but as increased recreation pressures develop this site should become warranted;

d. Sixty-seven upland reservoirs designed by the Soil Conservation Service as potential future sites should be re-evaluated as projected future needs develop. These sites are well distributed throughout the basin and should be investigated singly or in groups as the needs arise. Table 50 presents data on these sixty-seven sites and suggest the potential purpose or purposes for each site;

e. Finger Lakes Trail System additions. It is recommended that the trial system be enlarged to include a branch trail to connect the upper Genesee River "3-Rivers Rise" area and Allegany State Park;

f. Alma Pond, Allegany County, New York. This pond and wetlands area are noted for plant and bird life and should remain in its natural state for the future generation; and

g. Land Treatment Program, the program in the early-action plan meets only the most urgent needs in the basin. The program should be continued until all lands requiring treatment are in a management program.

TABLE 50 - Summary of potential upland reservoir sites to meet future needs.

SITE NO.	DRAINAGE AREA (SQ. MI.)	STORAGE (1) SEDIMENT AND FLOODWATER AC-Ft.	STORAGE (1) BENEFICIAL USE AC-Ft.	POOL FOR BENEFICIAL USE (AC.)	MAXIMUM FILL HEIGHT (Ft.)	TOTAL INSTALLATION COST ($1000)	POTENTIAL USE (2)
1-3	12.9	2,614	---	---	85	992	F.P.
1-6	3.2	396	---	---	66	406	F.P.
1-7	54.7	13,270	---	---	96	3,381	F.P.
1-8	34.0	6,562	---	---	96	1,502	F.P.
2-3	14.8	3,612	4,938	145	108	2,681	F.P.,Reg.
2-6	18.3	3,440	---	---	98	1,175	F.P
2-10	50.1	13,810	---	---	55	1,658	F.P.
3-2	10.4	2,468	---	---	86	949	F.P.
3-3	11.3	1,970	7,730	176	118	1,494	F.P.,Reg.
4-1	5.8	717	400	28	77	715	M
4-2	19.9	3,949	6,951	180	124	3,131	F.P.,Reg.
4-4	5.2	657	---	---	39	232	F.P.
4-5	7.1	1,049	4,540	133	100	1,204	F.P.,Reg.
5-13	24.8	3,138	---	---	88	943	F.P.
5-14	6.0	880	---	---	65	271	F.P.
5-16	10.5	1,510	---	---	71	1,207	F.P.
5-18	5.3	650	1,810	60	110	1,982	F.P.,F.W.
6-3	5.8	749	---	---	67	525	F.P.
	"	749	600	36	76	764	M
6-5	11.8	2,630	---	---	55	461	F.P.
	"	2,630	7,550	220	87	1,015	Reg.
6-6	3.7	590	---	---	55	238	F.P.
6-7	5.9	850	---	---	54	298	F.P.
7-3	11.7	1,285	---	---	61	524	F.P.
7-7	33.2	3,700	8,900	313	80	2,262	F.P.,Reg.
8-2	12.4	2,315	5,935	156	128	1,641	Reg.
8-10	6.2	3,970	3,970	120	108	1,315	Reg.
10-4	11.8	2,020	4,880	178	120	1,957	Reg.
10-7	32.0	4,290	6,210	160	128	2,692	Reg.
10-10	13.5	2,950	8,110	256	107	3,012	Reg.
10-16	6.9	1,290	4,416	156	77	1,714	Reg.
11-1	3.3	580	2,670	107	62	357	I
11-9	7.6	1,830	4,870	196	74	1,652	Reg.,I
11-10	12.8	3,780	2,520	285	39	1,297	F.P.,I
12-1	9.7	1,057	1,823	155	48	567	I
12-2	0.4	80	170	30	20	120	F.W.
13-2	2.7	596	---	---	83	216	F.P.
13-3	8.1	2,000	480	48	93	518	F.P.,M
13-5	17.7	3,142	9,617	210	138	1,820	F.P.,I
13-8A	4.0	893	---	---	65	312	F.P.
13-10	5.8	1,296	2,453	75	124	2,830	F.W.
13-11	6.8	808	1,692	57	101	1,153	F.W.,M
13-13	19.1	2,599	4,551	150	101	1,359	F.W.,M
13-24	1.8	336	984	31	88	652	F.W.
14-2	4.9	825	3,275	280	41	592	Rec.,F.W.
14-3	6.3	1,150	4,350	400	39	734	F.W.
15-3	5.8	760	1,277	195	23	412	F.W.
15-4	2.0	236	563	88	22	175	F.W.
15-5	3.5	414	912	160	25	365	F.W.
15-6	0.8	323	1,497	182	22	213	F.W.
15-7	7.8	1,140	575	150	23.5	760	F.W.
	"	1,140	575	150	23.5	678	I
15-8	5.4	564	688	130	22	306	F.W.
15-9	2.4	375	2,200	201	33.5	431	F.W.
	"	375	2,200	201	33.5	314	I
16-4	16.1	2,103	7,343	710	28	1,049	F.W.
16-5	1.2	165	310	67	15	69	F.W.
17-3	0.5	33	192	34	26	101	F.W.
17-5	18.0	2,588	6,412	1,100	22	320	F.W.
17-6	3.0	648	4,102	252	52	487	F.W.
17-11	1.1	137	723	109	20	121	F.W.
17-21	2.4	463	1,462	255	20	303	I
17-22	0.7	261	789	204	13	197	F.W.
18-5	1.7	227	663	138	16	131	F.W.,I
18-6	2.9	343	700	158	20	229	F.W.
18-8	4.2	320	1,300	170	24	349	L.F.
18-9	1.5	182	718	73	49	274	L.F.
19-4	0.6	118	102	28	13	46	F.W.
19-9	4.6	850	1,950	275	24	348	L.F.
19-10	1.0	111	264	110	9	143	F.W.
20-1	0.4	122	298	75	14	110	F.W.

(1) Total storage for given site is addition of Columns: Sediment-Floodwater and beneficial use.
(2) ABBREVIATIONS OF POTENTIAL USE

F.P. - Flood Prevention
Rec. - Recreation
F.W. - Fish & Wildlife
L.F. - Low Flow Augmentation
M. - Municipal Water Supply
Reg. - Regulation of Downstream Site
I. - Irrigation

PUBLIC HEARINGS

239. INITIAL HEARINGS

Four public hearings and one information meeting were held in conjunction with the study. The first two, held on the 18th and 19th of June 1963 in Rochester and Wellsville, New York, respectively were Public Hearings. They were joint hearings conducted by the Genesee River Basin Coordinating Committee and the State of New York Water Resources Commission. Attendance at each of these meetings was approximately 125 persons. Private individuals comprised 10% of those present at Rochester and 30% at Wellsville. Representatives of Industry comprised 10% of those present at both hearings and the remainder of those present represented Federal, State, County and municipal agencies as well as various civic organizations. The primary purpose in holding the hearings, as expressed to those present was to obtain everyone's opinions on the needs for development of water and related land resources in the Genesee River Basin and suggestions as to how these needs might be met.

240. INFORMATION MEETING

On the evening of 21 June 1966 a Public Information meeting was held by the Genesee River Basin Coordinating Committee, in Mount Morris Central School auditorium, Mount Morris, New York. The purpose of this information meeting was to present to the people of the basin the current study progress, show the ultimate goals and objectives of the study and provide an opportunity for members of the audience to ask questions. Attendance at this meeting was approximately 200 persons. Private individuals comprised nearly 30% of those present. Representatives of industry comprised 10% and the remainder of those present represented Federal, State, County and municipal agencies as well as various civic organizations.

241. FINAL HEARINGS

The last two Public Hearings were held on 25 and 26 October 1967 at Mount Morris and Rochester, New York. The hearings were held by the Genesee River Basin Coordinating Committee with Colonel A. L. Wright, U. S. Army Corps of Engineers and Mr. F. W. Montanari, Assistant Commissioner, Conservation Department, New York State as co-chairman. There were approximately 900 persons at the Mount Morris hearing and 300 persons at the Rochester meeting. Most persons requesting to be heard were allowed to speak and many of the questions submitted were answered.

242. The hearings were held to consider the proposed basin plan resulting from the comprehensive study as stated in paragraph 236, but the key item of interest in the proposed basin plan was the multiple-purpose Portage reservoir. The overwhelming consensus of those present was in opposition to the Portage reservoir, in fact there were no speakers in favor of the reservoir.

243. There were no members of Congress present at the hearings due to other commitments in Washington, but Congressman Charles E. Goodell and Barber B. Conable Jr., each had a representative present. Both representatives presented prepared statements by the Congressmen to the effect that they would reserve decision until a later date on the proposed basin plan until all views and testimony could be studied. Both Congressmen made public statements opposing the Portage Reservoir project a short time after the hearings, refer to Volume II, Appendix "A," Exhibits A29 and A30. Congressman Charles E. Goodell was appointed in September 1968 to the U. S. Senate to fill the unexpired term of the late Senator Robert F. Kennedy. A New York State Senator and two State Assemblymen spoke in opposition to the Portage reservoir at the Mount Morris hearing.

244. The Board of Supervisors of the three counties; Allegany, Wyoming and Livingston, which are affected by Portage reservoir, submitted resolutions against the reservoir, refer to Volume II, Appendix "A," Exhibits A31 to A34. These resolutions by the affected counties were not opposed in general to the entire basin plan. Allegany County favored immediate development of the Soil Conservation Service upland reservoir sites in their county and Livingston County favored the multiple-purpose Canaseraga Valley project.

245. The residents of the Genesee valley in the vicinity of the proposed Portage Reservoir project formed the "Genesee Valley Citizens' Association, Incorporated." This organization presented an opposition study report to the Portage project of some fifty pages. The report concentrated mainly on the values of the agricultural economy, loss of tax base, failure of the basin study to evaluate all of the secondary costs involved in the selling and re-establishment of farms, the present development of Letchworth State Park and the estimates for power development.

246. As a result of the critical statements pertaining to proposed Portage project at the public hearings the Coordinating Committee comments as follows:

a. Land Value - Questions were raised at the Mount Morris and Rochester Public Hearings regarding land value and productivity in the proposed Portage reservoir area. According to testimony at the hearings,

the Genesee River Basin Report gave the Genesee Valley area credit for an average gross income of only $7,840 per farm and land replacement cost of $50 to $60 per acre. The testimony also claimed that, of 77 farms affected by the proposed Portage project, 60 had an average gross income of $43,100 and replacement cost of the rich fertile land would be $400 to $500 per acre.

Actually, no information was provided in the Genesee River Basin Report concerning gross income of farms in the proposed Portage reservoir area. The average gross income of $7,840 and land values of $50-$60 per acre represent an average in the Allegheny Plateau Resource Region, not just the fertile valley areas.

The Corps of Engineers evaluated the land to be inundated by the Portage reservoir based on present assessed valuation. Each parcel of property involved was plotted on a property map and the assessed valuation obtained from the proper town. The New York State equalization rate was then applied to assessed valuation. This value was then checked against several recent sales with a local assessor. It was found that the recent sales were approximately 7 percent higher than their assessed valuation equalized. The real estate prices were then increased 10 percent to reflect the recent sale prices. For the large recreational acreage, the average value per acre of the area under investigation was used since much of the land was wooded hillsides and not the rich valley land. The Coordinating Committee therefore considers the land values in the report to be realistic.

b. Land - Concern was expressed at the hearings that food and fiber shortages may develop in the future; and questions were raised as to what consideration was given to this in the study; due to the large amount of land required for the Portage project.

Projections of future production requirements for agricultural products from the basin were developed from National and regional requirements based on National projections of population, per capita consumption rates, and imports and exports. Basin requirements take into consideration interregional advantages or disadvantages in the production of various farm products. These needs were then translated into land requirements. Projections of trends in land use were also made and compared with the land requirement projections. This comparison indicated that the supply of available land will be greater than that required to meet product needs.

Some concerns were also expressed about the consistency of a plan that recommends irrigation of lands in one area and inundation of highly productive lands in another area. The recommendation of providing irrigation water is based on projected demand for water for irrigation

of vegetables and potatoes, and does not stem from projected food and fiber needs. Parts of the basin have traditionally produced certain vegetable crops and potatoes and enjoy interregional advantage in their production. The Coordinating Committee considers that an increasing acreage of these crops will be irrigated in the future and that in multiple-purpose projects provisions should be made for supplying water to meet this future need.

c. Loss of Taxes - It was assumed in the benefit-cost analysis of the Portage project that increased economic development associated with the project would offset the loss of tax bases to the affected towns and school districts. It appears that such economic development would be significant. Accordingly, the Coordinating Committee considers this assumption to be realistic.

d. Secondary Costs - The standard real estate criteria used by the Corps of Engineers in accordance with existing law does not allow for inclusion of secondary costs such as, goodwill of business, loss of production for a season, increased cost of new farms and/or homes, acquisition costs of new farms, moving expenses and sentimental values.

e. Letchworth State Park - William Pryor Letchworth's deed to the State of New York dated December 31, 1906 contained the sole condition, "that the lands herein conveyed shall be forever dedicated to the purpose of a Public Park or Reservation,..".

The right abutment of the Portage dam would be constructed on a small portion of the land conveyed to the State by the Letchworth deed. Testimony at the hearing questioned the legality of constructing the dam. This is a legal matter. However, so long as the purpose of the dam is tied into an extension of the Park and is necessary to create a useable recreation area for that park expansion, it appears to the Coordinating Committee that it could be interpreted as, "for the purpose of a Public Park or Reservation."

Concern was also voiced that Letchworth State Park was not even half developed to date. Therefore, why was it not developed before vast new lands are acquired for recreation at the proposed Portage reservoir?

Development of Letchworth State Park will be continued as State funds become available. The park will be developed as fully as good recreation practices allow, but some areas must remain undeveloped to protect the scenic beauty of the gorge, and act as buffer zones between the different park activities. Letchworth is not a water-oriented park, but future demands will require ever increasing water-oriented activities.

Thus Portage reservoir would supply this demand, have scenic beauty different from the Letchworth's gorges and have adequate buffer zones.

f. Power Development Estimates - Testimony at the hearing questioned the reliability of the power estimates since private interests had found in the past that power was not economically feasible at the Portage site.

Previous investigations by private power interests have been for a single-purpose power development. If the considered Portage project were a single-purpose power development, it too would be uneconomical. But evaluated as a part of a multiple-purpose project, it is economically feasible.

Testimony also revealed that a private power company had retained an independent consultant to assist in an analysis of the Portage power features. Their findings were that the Corps of Engineers had grossly understated the cost of power.

The State of New York subsequent to the hearing retained the service of another consulting engineering firm to review the power project. One of their conclusions was that the power features could be constructed for about the same cost as estimated by the Corps of Engineers based on the limited sub-surface information available. The Federal Power Commission reviewed the power proposal and their preliminary cost estimate was somewhat lower than cost used by Corps of Engineers in the economic evaluation of the project. In view of the foregoing, the Coordinating Committee continues its support of the estimates of power costs in this study.

247. IMPACT OF FINAL HEARING ON PLAN

As a result of the two hearings on the proposed Basin Plan the Coordinating Committee members met and reviewed the testimony. The intense local and Congressional opposition is based on the very understandable desire of the inhabitants of the valley not to be displaced from their homes and livelihood. This type of opposition was expected and is typical in water resource projects. It has not been a bar to projects where benefits are realized by others, which, in the judgment of policymakers outweigh the disadvantages to those being displaced. However, in the case of this project, no support was expressed by those who stand to benefit from its construction. The Coordinating Committee, therefore, concludes that the project should be deferred from being recommended as part of the early-action program. However, because it was the consensus of the members that Portage is an excellent site for a multiple-purpose reservoir development, and because a large part of the Basin's needs will not be met, additional studies appear warranted.

These studies should include possible alternative sites for water-oriented recreation, a smaller scale of recreational development, development of the site by other than the Federal Government, a complete agricultural impact study and possible use for other purposes such as water supply.

248. The State of New York and the several counties of the Genesee Basin have subsequent to the public hearings formed the Genesee Basin Regional Water Resources Planning Board. This Board should give high priority to the re-evaluation of Portage.

249. The hearings demonstrated that the other recommendations of the proposed Basin Plan were, in general, acceptable to the public. Therefore, the consensus of the Coordinating Committee was to include these items in the early-action plan for recommendation.

IMPACT OF EARLY-ACTION PLAN

250. GENERAL

The following paragraphs present quantitative evaluations of the influences which would be exerted by the early-action plan recommended in this report and shown on plate 1. It should be noted that the early-action plan falls far short of meeting all of the projected demands of the Basin, as shown by table 51. The principal unmet demands are recreation, fish and wildlife, irrigation within the Basin, land treatment and erosion control. It has identified and included those projects and programs, except the Portage multiple-purpose project, which would have a benefit-to-cost ratio greater than unity. Since the long-range program is essentially a flexible framework for future development it is not considered that a detailed appraisal of its effects is warranted at this time.

TABLE 51 - Demands Met by Early-Action Plan

Needs	1980		2020	
	Existing or Projected Program	Early-Action Plan (1)	Existing or Projected Program	Early-Action Plan (1)
Recreation (Market Area)	65%	72%	45%	48%
Fish & Wildlife (Influence Area)	35%	63%	33%	48%
Water Quality (Critical Sectors)	78% (2)	96% (3)	78%	100%
Water Supply	100%	100% (4)	100%	100%
Irrigation				
Basin	36%	52%	17%	25%
Lake Plains	41%	138% (5)	20%	67%
Power	0%	0%	0%	0%
Flood Control				
Local Protection	80% (6)	100% (6)	80% (6)	100% (6)
Flood Plain Management	0%	100% (7)	100%	100%
Land Treatment				
Croplands	36%	36% (8)	98%	98% (8)
Pasture	27%	27% (8)	98%	98% (8)
Forest	17%	27%	67%	78%
Erosion (Mainstem Bank Control)	2%	2%	2%	2%

(1) Percentage demand satisfied, including existing or projected program.
(2) Based on existing 23 critical sectors in the Basin, 18 of these sectors can be corrected by secondary treatment facilities.
(3) 100%, if releases from Stannard Reservoir are included.
(4) Water supply for Warsaw provided.
(5) Capability exceeds demand during early-ation period (to 1980)
(6) Based on 5 major flood control projects in Basin, thus reducing damages only in the major flood damage areas of the Basin.
(7) Flood Plain Management program was initiated for Black Creek area during late stages of comprehensive study.
(8) No major acceleration of existing programs are anticipated.

251. The impact of early-action plan does not include the Stannard Reservoir project which has been investigated and evaluated in this study. The data compiled by the Genesee River Basin study was furnished to the Water Development Committee for Appalachia and their evaluation of benefits under their special criteria resulted in a very favorable benefit-cost ratio, even with a 4-5/8 percent interest rate. The impact of the Stannard project on the economy of the upper Genesee River basin should be considerable and is given in detail in the "Report for Development of Water Resources in Appalachia," Part III - Project Analysis, Chapter 10. A summary of its impact is given in the "Additions."

252. OUTDOOR RECREATION

The plan includes 5 single-purpose upland reservoir sites, 8 multiple-purpose upland reservoir sites, and 8 river access sites of B.O.R. These sites combined would provide 21 percent of the projected unsatisfied needed annual recreation days for the Recreation Market Area in the year 1980 and 6 percent of the estimated unsatisfied annual recreation day needs in the year 2020. Table 52 summarizes the recreation program.

TABLE 52 - Recreation market area supply, demand and deficit

			Recreation Days (1000's) Summer Season					
			1980			2020		
Agency	No.	Type	Supply	Demand	Deficit	Supply	Demand	Deficit
SCS	13	Reservoir	2,300			2,300		
BOR	8	Access Site	600			600		
OTHER	-	Existing & Projected	26,300			41,150		
TOTAL			29,200	40,250	11,450	44,050	91,650	47,600

253. FISH AND WILDLIFE

The plan includes 11 single-purpose upland reservoir sites, 13 multiple-purpose upland reservoir sites, 1 multiple-purpose local protection project and 3 waterfowl areas. These combined measures would provide fishing opportunities for 43 percent of the projected unsatisfied fisherman day needs including latent demand for the Influence Area in the year 1980 and 22 percent of the unsatisfied fisherman day needs in the year 2020. Table 53 summarizes the fish and wildlife program.

TABLE 53 - Fish and wildlife influence area supply, demand and deficit

Agency	No.	Fisherman-days (1,000's) 1980 Supply	1980 Demand	1980 Deficit	2020 Supply	2020 Demand	2020 Deficit
SCS	24	581			581		
Existing& Projected		715			1,300		
TOTAL		1,296	2,060	764	1,881	3,900	2,019

254. WETLANDS

Waterfowl habitat is in short supply in the Basin and there is a constant reduction of the existing habitat. Therefore, the wetlands that still exist should be saved and improved for waterfowl through acquisition and development. The Basin Plan identifies the most important wetlands that should be preserved, the swallow marshes associated with Conesus Lake and Honeoye Lake. The important wetlands of the Groveland Flats on the Canaseraga Creek and Birdsall Swamp on Black Creek have been included in the proposed Canaseraga Valley project and upland reservoir site, 7-2 respectively.

255. WATER QUALITY

The plan includes 3 single-purpose upland reservoir sites, 1 multiple-purpose upland reservoir for water quality management. Flows released from these reservoirs would eliminate water quality problems in four of the critical tributary stream reaches remaining in 1980 provided that secondary treatment is provided in all critical stream reaches. Direct diversion of treated effluent to Lake Ontario would provide the solution to the one major critical stream reach in the lower Genesee River at Rochester. The tributary reach at Silver Lake outlet at Perry is critical. Water quality improvement in this reach would be met by the re-regulation of Silver Lake outlet. The water quality problem in the Genesee River reach at Gates-Chili-Ogden could be eliminated by flow releases from Stannard Reservoir. This site was investigated in this study, but found uneconomical in accordance with criteria for this study. Stannard is economical under the Appalachia Study and it is expected that it will be recommended in that study. Thus the impact of the reservoir will add to the benefits resulting from this study. Table 54 summarizes the water quality management flow requirements.

TABLE 54 - Flow Requirement for Water Quality

Stream Sector	Gross Maximum Required Flow	Reservoir Proposed Name	Agency
	cfs (1)		
Genesee River			
Gates-Chili-Ogden	166	Stannard	CE
Oatka Creek			
Warsaw	3.9	18-2	SCS
Honeoye Creek			
Honeoye Falls	6.9	17-12	SCS
Mill Creek			
Wayland	0.7	13-27	SCS
Wilkins Creek			
Livonia	0.9	16-7	SCS

(1) Reservoir releases would range from zero to maximum shown as stream conditions warranted.

256. WATER SUPPLY

Local water sources are believed fully capable of meeting basin demands for rural domestic water supply. Individual well systems if organized into water supply systems should be sufficient to meet demands of the Basin's localities. The village of Warsaw is the exception to the above statement. A Soil Conservation Service reservoir, 18-7, could supply the needed water. The water supply of the metropolitan Rochester area is adequate since the area appears committed to Lake Ontario for water.

257. IRRIGATION

The plan includes irrigation in both the Genesee Basin and the Ontario Lake Plain Service area. In the Basin, the plan includes 3 multiple-purpose upland reservoir sites. There are approximately 49,000 acres of farm land generally located in small, scattered areas in the northern subwatersheds which are believed to be irrigable. In 1964, about 5,200 acres were irrigated and the major source of water was natural stream flow. These 5,200 acres represent the maximum acreage that can be served adequately from existing sources. The combined proposed reservoirs in the Basin would supply 25 percent of the

1980 and 9 percent of the 2020 unsatisfied irrigation acreage demand. Table 55 summarizes the irrigation plan in the basin.

TABLE 55 - Future Irrigation Water Demand and Deficit in the Basin

No.	Type	Irrigable Land Acres	1980 Irrigated Acres	1980 Demand Acres	1980 Deficit Acres	2020 Demand Acres	2020 Deficit Acres
3	Multiple-Purpose		2,360				
	Existing		5,200				
TOTAL		49,600	7,560	14,500	6,940	29,900	22,340

258. In the Lake Ontario Plain Service Area there are proposed 29 single-purpose, upland reservoir sites. Land with soil types, slopes and drainage conditions adaptable to irrigation is estimated at about 183,000 acres. In 1964, irrigated acreage amounted to 5,450 acres and is about all that could be served from existing sources of supply. The combined 29 reservoirs would supply more than 100 percent of the 1980 and 58 percent of the 2020 unsatisfied acreage demand. The Lake Plain irrigation plan is shown on table 56.

TABLE 56 - Future Irrigation Water Demand and Deficit Lake Ontario Plain Service Area

No.	Type	Irrigable Land Acres	1980 Irrigated Acres	1980 Demand Acres	1980 Deficit Acres	2020 Demand Acres	2020 Deficit Acres
29	Single-Purpose		13,000				
Existing			5,450				
Total		183,000	18,450	13,360	----	27,670	9,220

259. POWER

The Portage Project, in a deferred category, would furnish 200,000 KW of dependable capacity and a net average annual output of 203,000,000 KWH. This hydroelectric power resource could assist in meeting future peak power demands of the Genesee basin power market area.

260. FLOOD CONTROL

There were three areas in the Basin having flood damages sufficient to warrant possible remedial measures. The Canaseraga Project is proposed to give a 5-year summer protection to one problem area. The Red Creek Project has been authorized by the 89th-2 Congress to solve another problem area. Flood Plain Management is considered the only feasible method for the future in the Black Creek - Genesee River area of the town of Chili. If unexpected development should occur in other locations in the basin that now experience only minor flood damage, the local officials should request Technical Assistance under the Corps of Engineers Flood Plain Management Program to develop flood profiles and aid in establishment of regulations for the new development. This would aid in keeping flood damage to a minimum.

261. LAND TREATMENT

The projection of land use in the Basin for the period 1970 to 2020 indicate a cropland acreage decline of about 21 percent; pasture lands decline about 22 percent; forest land increase of about 21 percent; lands in urban use will increase about 92 percent; and the residual, or land in other uses including idle land and recreational land will increase 35 percent. The land treatment program to 1980 proposed by the Department of Agriculture would accomplish the following as shown in table 57.

TABLE 57 - Land treatment program

Land Use	Total acreage in Basin	Acres Needing Treatment	Acres To Be Treated	% Treatment	Acreage Remaining To Be Treated
Cropland	627,000	312,000	111,000	36	201,000
Pasture	240,000	154,000	42,000	27	112,000
Forest Land	428,000	271,000	74,500	27	196,500
Total	1,295,000	737,000	227,500		509,500

262. EROSION. The Basin as a whole is not severely affected by sheet erosion, but significant benefits could be realized by the land treatment program proposed in paragraph 261. Stream bank erosion along the main Genesee River is widespread and causes locally severe losses of cropland and buildings. Studies determined that a major bank stabilization program is not economically feasible and the Federal government does not have authority in this area, bank protection, except for emergency measures under Section 14 of the 1946 Flood Control Act. Bank stabilization in small local areas such as the State of New York is undertaking at Belfast should be observed and if the results warrant, be encouraged at other critical locations.

263. OTHER CONSIDERATIONS IN EARLY-ACTION PLAN

The plan would meet only approximately 21 percent of the projected unsatisfied 1980 recreation needs. There are several lakes Canandaigua, Keuka, Conesus, Honeoye, Silver, and Rushford providing water-oriented recreation opportunity, but most of their usable shorelines are in private ownership. Therefore, serious consideration should be given by the non-Federal planner to increasing public access to those lakes. Also the two lakes, Hemlock and Canadice, would offer exceptional potential at a relatively low cost if agreements could be reached with the owner, the city of Rochester, and a non-Federal agency for the proper management and development of the water-oriented natural resource.

264. The "3-Rivers Rise" area at the headwater of the West Branch of Susquehanna, Genesee and Allegheny Rivers should be preserved in its natural state. This area should be included in the action program of the Pennsylvania Statewide Outdoor Recreation Plan.

265. APPALACHIA PROGRAM

The Stannard multiple-purpose reservoir project was one of the four major reservoirs investigated in phase II studies by the Corps of Engineers in the Genesee Study. It can be observed in table 38 that a reservoir with industrial water supply appears feasible. These data were furnished to the Office of Appalachian Studies, Corps of Engineers since their criteria allowed industrial water supply for regional development as a project purpose. Although the Water Development Coordinating Committee for Appalachia's report has not been released, the Stannard Reservoir Project is expected to be recommended in that report. Therefore, the Genesee River Basin Coordinating Committee, because of present indications of that report, has included the Stannard Project, in the Genesee River Basin early-action plan. The impact of this decision to include Stannard Reservoir on the unmet needs of the basin is discussed in the "Additions" to the "Summary Report."

266. HEALTH ASPECTS

The impact of the early-action plan insofar as health aspects are concerned will be favorable provided appropriate attention is given to the development of features required to safeguard health and well-being when detailed planning of the recommended projects are undertaken. It should be recognized that recently the conception of the "Public Health Aspects of the Water Resources" development planning has been

broadened. Important factors which must be considered and included in projects and programs are as follows:

(a) Vector control measures both in the construction and operation of projects;

(b) Epidemiology of water born diseases; and

(c) Sanitary survey of water and related land resources.

ECONOMIC EVALUATION OF RECOMMENDED PLAN

267. GENERAL

Economic evaluations were made of projects included in the early-action plan of development as shown on plate 1. First costs include all initial expenditures for physical construction of the project, including lands and damages, relocation, reservoir clearing, engineering and design, and supervision and administration. Annual charges include interest and amortization, which includes interest during construction and operation, maintenance, and an annual equivalent cost of major replacements. An interest rate of 3-1/8 percent was used on all projects, except Portage Reservoir, for both Federal and non-Federal costs, rather than 4-5/8 percent which came into effect by notice from the Water Resource Council on 24 December 1968. It was felt that a revision in the interest rate for projects in this study would not be warranted at this late date. By remaining with the 3-1/8 percent interest rate all projects, preliminary and survey scope, in the study can be compared on a common basis. The only project evaluation that differs from the 3-1/8 percent interest rate is the Portage project in which 3-1/4 percent rate was used since it was in effect at the time of evaluation as shown in Appendix "B." It is recognized that for any project in this study for which an authorization report is to be prepared, it must be re-evaluated using 4-5/8 percent interest rate or the proper rate at the time of submission of the authorization report. A 100-year project life was used for reservoir projects and 50-year project life for local flood protection projects. Estimates of cost for upland reservoir projects were based on a comparative study of actual contract costs of PL-566 structures in northeast United States.

268. Benefits which would accrue from reduction in damages from floods and inadequate drainage, land enhancement, water supply, water quality control, hydroelectric power, irrigation, recreation, and fish and wildlife have been reduced to an average annual equivalent value.

269. Tables 58 through 62 show the benefits and costs for the various projects which are included in the early-action program. Table 62 is the summary of costs for the recommended Plan for the Genesee.

TABLE 58 - Economic evaluation - Early-Action Plan for upland reservoirs in the basin.

Site	Recreation: Recreation days	Recreation: Annual Benefits	Fish and Wildlife(1): 1980 Mandays	Fish and Wildlife(1): Annual Benefits	Irrigation: Storage A-ft.	Irrigation: Annual Benefits	Water Quality: Storage A-ft.	Water Quality: Annual Benefits	Water Supply: Storage A-ft.	Water Supply: Annual Benefits	Total Annual Benefit	Total Annual Cost	Estimated Total Cost	Estimated cost of Federal(2) participation	Benefit-Cost Ratio
1-5	82,700	$ 62,000	11,300	$ 15,900							$ 77,900	$ 94,400	$1,741,000	$ 871,000	0.8
3-1			21,600	83,600							83,600	68,800	1,997,000	999,000	1.2
3-4	97,300	73,000	17,000	44,900							117,900	112,700	2,194,000	1,097,000	1.1
5-1	30,000	22,500	15,500	40,400							62,900	49,400	938,000	469,000	1.3
5-21			13,100	45,900							45,900	21,700	424,000	212,000	2.1
7-1			12,700	48,000							48,000	25,100	665,000	333,000	1.9
7-2	160,000	120,000	173,200	484,800							604,800	157,100	2,318,000	1,159,000	3.8
8-13	56,000	42,000	22,700	88,000							130,000	39,500	478,000	239,000	3.3
9-3			5,800	20,400							20,400	31,100	847,000	424,000	0.7
10-2	26,700	20,000									20,000	18,500	260,000	130,000	1.1
10-3			12,200	46,000							46,000	11,800	259,000	130,000	3.9
10-14	30,000	22,500									22,500	18,400	223,000	112,000	1.2
11-2			33,500	131,200	1,100	$ 36,400					167,600	17,600	329,000	165,000	9.5
11-4			9,200	34,000							34,000	19,400	491,000	246,000	1.8
13-1			10,500	35,500							35,500	33,400	825,000	413,000	1.1
13-6	97,200	72,900	28,600	107,900							180,800	86,300	1,148,000	574,000	2.1
13-22			9,400	34,800							34,800	36,700	1,019,000	510,000	1.0
13-27							230	$13,500			13,500	9,200	273,000		1.5
14-5			13,500	48,700							48,700	24,000	555,000	278,000	2.0
15-2	72,000	54,000	1,300	18,000				-			72,000	57,600	828,000	414,000	1.3
16-2	48,700	36,500									36,500	30,900	392,000	196,000	1.2
16-7							330	10,000			10,000	5,300	157,000		1.9
17-1			20,800	80,400							80,400	35,900	995,000	498,000	2.2
17-7			12,400	46,800							46,800	45,100	1,274,000	637,000	1.0
17-8			21,700	59,000							59,000	23,200	551,000	276,000	2.5
17-12			44,500	125,400			6,660	19,800			145,200	32,600	760,000	380,000	4.5
17-19			29,000	99,400	690	22,100					121,500	31,500	636,000	318,000	3.9
17-24	96,000	72,000	25,100	69,200							141,200	62,400	671,000	336,000	2.3
18-2							1,490	37,500			37,500	10,400	308,000		3.6
18-7									700	$16,300	16,300	16,300	484,000		1.0
19-7			16,700	40,000	570	18,200					58,200	34,100	771,000	386,000	1.7
19-11	900,000	675,000									675,000	420,000	2,761,000	1,381,000	1.6
20-2	600,000	450,000									450,000	284,100	1,963,000	982,000	1.6
TOTAL	2,296,600	$1,722,400	581,300	$1,848,200	2,360	$76,700	8,710	$80,800	700	$16,300	$3,744,400	$1,964,500	$29,535,000	$14,165,000	1.9

(1) Based upon values in Appendix "H," Fish & Wildlife, dated May 1969.
(2) Based upon current P.L. 566 Cost Sharing Criteria for these purposes.

TABLE 59 - Economic evaluation, major projects by Corps of Engineers

Project	Stream	Drainage area Sq. mi.	Total Storage A-F	Flood Control		Fish & Wildlife			Recreation			Water Quality		Power			Total Annual Benefits	Total Annual Cost	Estimated Investment Cost	Estimated Cost of Federal Participation	Benefit Cost Ratio
				Annual Benefits	Annual Costs	Annual Days	Annual Benefits	Annual Costs	Annual Days	Annual Benefits	Annual Costs	Annual Benefits	Annual Costs	Annual energy mwh	Annual Benefits	Annual Cost					
				$	$	(1)	$	$		$	$	$	$		$	$	$	$	$	$	
EARLY ACTION PLAN																					
Canaseraga	Canaseraga	335	---	194,900	190,000	2,797,000	197,900	140,000	---	---	---	---	---	---	---	---	392,800	330,100	7,699,000	6,865,000	1.2
DEFERRED PLAN																					
Portage Reservoir	Genesee	985	283,000	---	---	(2) 400,000	275,000	(3)	2,000,000	2,689,000	2,664,000	138,000	130,000	412,400,000	4,766,000	2,946,000	7,868,000	5,740,000	96,800,000	91,005,000	1.4
LONG RANGE PLAN																					
Tuscarora Reservoir	Keshequa	69	46,000	2,000	---	(2) 92,000	496,000	---	290,000	218,000	---	---	---	---	---	---	716,000	726,000	16,490,000	---	0.99
Wiscoy Reservoir	East Koy & Wiscoy	108	43,200	3,500	---	---	90,000	---	---	1,800	---	---	---	---	22,000	---	113,800	578,000	16,000,000	---	0.2
Oatka Reservoir	Oatka	161	44,500	4,400	---	---	217,000	---	1,006,000	754,000	452,700	---	---	---	7,000	---	529,400	588,000	16,300,000	---	0.9

1. Total use Waterfowl days.
2. Fisherman-days.
3. Annual cost included with "Recreation".

TABLE 60 Economic evaluation, Early-Action Plan irrigation structures in Ontario Lake Plain

Site	Storage A-F	Annual benefits	Annual cost	Estimated total cost	Estimated cost of Federal participation	Benefit-cost ratio
B-2	204	$ 4,200	$ 3,400	$ 76,000	$ 38,000	1.2
B-7	300	6,500	5,800	125,000	63,000	1.1
B-9	190	4,100	4,100	98,000	49,000	1.0
B-17	340	7,400	6,000	116,000	58,000	1.2
B20A	513	11,100	10,800	230,000	115,000	1.0
B-21	540	11,700	9,100	173,000	87,000	1.3
B-24*	230	5,000	6,700	116,000	58,000	0.8
C-3	780	16,900	19,400	546,000	273,000	0.9
C-4	324	7,000	4,300	93,000	47,000	1.6
C-8A*	519	11,200	10,700	195,000	98,000	1.1
C-11*	604	13,100	12,900	247,000	124,000	1.0
C-12	300	6,500	8,000	155,000	75,000	0.8
C-13*	216	8,100	8,100	185,000	93,000	1.0
D-2*	1,780	38,600	22,900	317,000	159,000	1.7
D-4*	800	17,300	12,500	277,000	139,000	1.4
D-6	152	3,300	3,900	94,000	47,000	0.9
D-7	267	5,800	4,300	126,000	63,000	1.4
D-8*	332	7,200	7,100	119,000	59,000	1.0
D-12	372	8,100	5,600	113,000	56,000	1.4
E-4	520	11,300	8,000	212,000	106,000	1.4
E-6	387	8,400	11,000	327,000	164,000	0.8
E-19	800	17,300	13,700	245,000	123,000	1.3
E-20	400	8,700	6,800	178,000	89,000	1.3
F-5	173	3,800	3,200	65,000	33,000	1.2
F-6	400	8,700	9,300	175,000	85,000	0.9
G-3	384	8,300	3,900	112,000	56,000	2.1
G-4	278	6,000	5,000	133,000	67,000	1.2
G-6	500	10,800	6,300	144,000	72,000	1.7
G-12A*	376	8,200	7,900	193,000	97,000	1.0
TOTAL	12,981	$284,600	$240,700	$5,185,000	$2,593,000	1.2

* Systems with Channels and/or external distribution systems

TABLE 61 - Cost Summary, Early-Action Plan, Land Treatment Program

LAND USE	Acres to be treated	COST		
		TECHNICAL	INSTALLATION	TOTAL
Cropland	111,000	$ 999,000	$ 6,127,000	$ 7,126,000
Pasture	42,000	378,000	2,377,000	2,755,000
Forest Land	74,500	985,000	2,045,000	3,030,000
TOTALS	227,500	$2,362,000	$ 10,549,000	$12,911,000

TABLE 62 - Summary of cost for the Genesee River Basin Plan

Development	Estimated Total Cost	Estimated Cost Federal Participation
EARLY-ACTION PLAN		
33 Upland Reservoir Sites	$29,535,000 (1)	$14,165,000 (1)
Land Treatment	12,911,000	---
Canaseraga Multiple-purpose	7,699,000	6,865,000
Flood Plain Management (Black Creek)	26,000	26,000
Hemlock Lake Recreation Area	(2)	(2)
Canadice Lake Recreation Area	(2)	(2)
8 Recreation Access Sites	1,600,000	800,000
"3-River Rise", Natural History Area	300,000	150,000
Conesus Lake Wetland Area	540,000	270,000
Honeoye Lake Wetland Area	1,000,000	500,000
SUBTOTAL BASIN	$53,611,000	$22,776,000
29 Reservoirs-Ontario Lake Plains	5,185,000	2,593,000
SUBTOTAL EARLY-ACTION PLAN	$58,796,000	$25,369,000
APPALACHIA PROGRAM		
Stannard Multiple-purpose Reservoir (3)	37,500,000	31,352,000
TOTAL EARLY-ACTION PLAN	$96,296,000	$56,721,000
DEFERRED PLAN		
Portage Reservoir	$96,800,000	
LONG RANGE PLAN		
Tuscarora Reservoir	16,490,000	
Wiscoy Reservoir	16,000,000	
Oatka Reservoir	16,300,000	
67 Upland Reservoir Sites	64,450,000	
Land Treatment	28,260,000	
Finger Lakes Trails (additions)	1,000,000	
Alma Pond, Natural Area	150,000	

(1) If Stannard multiple-purpose reservoir is constructed, one Upland Reservoir site would be deleted, refer to "Additions to Summary Report," making "Estimated Total Cost" $27,341,000 and "Federal Participation" $13,068,000

(2) No estimate

(3) Cost based on project formulation by Water Development Committee for Appalachia

IMPLEMENTATION OF PLAN

270. GENERAL

The proposed plan for the development of the water and related land resources of the Genesee River Basin includes structural and nonstructural measures. Those structural measures included in the early-action program should be implemented within the next 10 to 15 years. Further investigation should be implemented as to scale of recreation development, project purposes, economic feasibility and possible alternatives before determining whether the deferred Portage multiple-purpose project should be included in the early-action program, the framework plan or any plan. Additional studies will be required before implementation of any of the structural measures included in the framework portion of the plan. Therefore the discussion of implementation of structural measures in this report is limited to those in the early-action program. Nonstructural measures should be implemented at the earliest practicable date in order to obtain their maximum benefit. State legislation, and possibly federal, is required before irrigation on a scale significantly greater than existing can be undertaken in New York. Therefore, this plan carries with it the recommendation that appropriate legislative action be taken to aid the implementation of irrigation project development of the type designed herein.

271. Owing to Federal legislative restrictions, only those watersheds which include flood control and/or agricultural water management as primary purposes are eligible for construction with federal cost sharing. All of the potential irrigation structures in the Ontario Lake Plain Service Area can be constructed under the current program. Only three of the Genesee's 20 Basin watersheds fall in the above category, Watersheds 11, 17 and 19.

272. Therefore, at the request of the Department of Agriculture's member, the Coordinating Committee submits the following:

> "It is recommended that the Secretary of Agriculture be authorized to carry out the upstream aspects of the Genesee River Basin Comprehensive Plan which needs to be installed to meet needs identified for 1980 and which are listed in table 58, with such modifications, thereof, as in the discretion of the Secretary of Agriculture may be advisable.
>
> "In carrying out this program, it is recommended that the Secretary of Agriculture be authorized to participate in single and multi-purpose developments for flood prevention, irrigation, drainage,

water quality control, fish and wildlife developments, recreation, municipal water supply and accelerated land treatment associated with project plans. Federal technical and cost-sharing assistance should be the same as that contained in other existing authorities provided the Secretary.

"The Secretary's participation should be based on project plans to be submitted to him by appropriate agencies of the Department of Agriculture. Such plans will be developed only after appropriate applications have been received by the Secretary from qualified local sponsoring organizations and will be consistent with the findings and provisions of this comprehensive plan. The planning and development work will be coordinated with other federal and state agencies. Operation and maintenance of all developments will be the responsibility of local sponsoring organizations."

273. The recently formed Genesee Basin Regional Water Resources Planning Board will have the capability of refining this plan. Measures and programs excluded from this plan because they cannot presently be implemented by the Federal government, can be further evaluated by the Board to determine their feasibility for satisfying water and related land resources needs from regional and local viewpoints as well as national. Under Article V, Part V of the New York State Conservation Law, regional water resources planning boards are established after application by interested counties, favorable public hearings and approval by the New York State Water Resources Commission. Additional information is contained in Volume V, Appendix "G," State Water Laws.

274. STRUCTURAL MEASURES

Implementation of the structural measures in the early-action program require action by the following organizations:

a. Department of Agriculture - Three upland reservoir sites and twenty-nine reservoir sites in the Ontario Lake Plain should be proposed for construction by the Soil Conservation Service in accordance with the Watershed Protection and Flood Prevention Act of the 83rd Congress, Public Law 566. Sponsoring organizations must initiate this action by submitting appropriate applications for those sites they have an interest in;

b. Corps of Engineers - An authorizing report should be prepared for the multiple-purpose Canaseraga Valley project for local flood protection and waterfowl habitat improvement and submitted to Congress for authorization through normal Corps of Engineers channels; and

c. Genesee Basin Regional Water Resources Planning Board - Twenty-nine Department of Agriculture upland reservoirs should be considered for early-action recommendation by the Board, and support given to expedite authorization of the Secretary of Agriculture to participate in the development of upland reservoirs for purposes other than flood control and/or agricultural water management. Where appropriate, such participation should involve multiple-purpose watershed system development.

The Board should investigate means to develop the Hemlock and Canadice Lakes recreation areas, develop the eight recreation sites on the Genesee River and Barge Canal and take the necessary steps to insure the continence of the wetlands associated with Conesus and Honeoye Lakes.

275. NONSTRUCTURAL MEASURES

Implementation of nonstructural measures of the comprehensive plan will require the cooperation of many Federal, State and local agencies. Management programs for controlling and regulating the economic use and development of flood plains and for reducing flood losses to existing developments in areas where flood control is not economically feasible should be undertaken by State and local governments in conjunction with Federal interest. While Federal agencies can prevent unwise Federal and Federally assisted construction in the flood plains and provide information and guidance on flood hazard areas, State and local leadership in flood plain management is essential for it to become effective. Regulation of flood plain usage by zoning, subdivision regulations, building codes, and other police power measures can be done only by State or local governments. Legislation should be passed by the State requiring local communities with existing or potential flood problems to establish flood plain regulations. In addition, programs should be undertaken to define floodways throughout the State. The Corps of Engineers, under the provisions of Section 206, Public Law 86-645, will assist State and local governments and their planning agencies in implementation of flood plain management programs.

276. Current land management and conservation programs should be continued and accelerated by local interests in cooperation with the Department of Agriculture. State agencies and local interests, in cooperation with the Bureau of Outdoor Recreation and the Bureau of Sport Fisheries and Wildlife should undertake programs to complete an adequate recreation plan and a diversified fish and wildlife program for the basin. An adequate water hygiene program should be maintained by the State in cooperation with the Public Health Service. Maximum practicable treatment of all wastes entering the basin's streams will require a cooperative effort of State agencies, the Public Health Service, and the Federal Water Pollution Control Administration.

277. ADMINISTRATION OF RECREATION DEVELOPMENT

The United States Department of the Interior, Bureau of Outdoor Recreation in the course of their recreation studies and in conjunction with the Recreation Task Group have made suggestions as to the level of administration of proposed recreation developments in the Genesee River Basin. The capability of the various administrative levels to finance and operation recreation areas and programs varies widely, as would their future commitments to other programs. Also, the present legislative authority of the various levels, especially local, may require substantial changes prior to participation in an extended outdoor recreation program. Table 63 presents suggested administrative levels for the recreation features of the Basin Plan and a possible guide to the Genesee Basin Regional Board of administrative alternatives.

TABLE 63 - Suggested administrative alternatives in outdoor recreation

Development	Federal	State	County	Local	Private
EARLY-ACTION PLAN					
Upland Reservoir - S.C.S.					
1-5		X	X		
3-4		X	X		
5-1				X	X
7-2		X	X		
8-13		X	X		
10-2					X
10-14					X
13-6			X		X
15-2		X			
16-2				X	X
17-24		X	X		
19-11			X	X	
20-2			X	X	
Access Sites					
3 Upstream, Genesee River			X	X	
3 Downstream, Genesee River		X	X		
2 Barge Canal		X		X	X
Other					
Hemlock Lake		X	X	X	
Canadice Lake		X	X	X	
"3 Rivers Rise", Natural Area		X			
DEFERRED PLAN					
Portage Reservoir - C.E.	X				
LONG RANGE PLAN					
Major Reservoir - C.E.					
Tuscarora		X			
Wiscoy		X			
Oatka		X	X		
Trails					
Finger Lakes Trails(addition): Associated with other development	(Same as managing agency for site)				X
Other					
Alma Pond, Natural Area					X

RECOMMENDATIONS

278. The Coordinating Committee makes the following recommendations:

RECOMMENDATION I

1. That the plan of structural and nonstructural measures presented in this report be adopted as the basic plan for development and beneficial use of the water and related land resources of the Genesee River Basin.

2. That the early-action program be adopted, which includes the following projects that are needed now and are economically justified for construction within the next 10 to 15 years:

a. Thirty-three upland reservoir sites;

b. Land treatment measures, 111,000 acres of cropland, 42,000 acres of pasture, 74,500 acres of forest;

c. The Canaseraga multiple-purpose project, for local flood control and waterfowl habitat improvement;

d. Black Creek flood plain management, a flood plain information study should be made that would enable the town of Chili officials to regulate the flood plain;

e. Hemlock and Canadice Lakes recreation areas, an agreement should be made with the city of Rochester, to allow the development of these lakes for recreation;

f. Eight recreation access sites (Main River & Barge Canal);

g. "3-River Rise" Natural History area, would include the headwaters of the West Branch of the Susquehanna, Genesee, and Allegheny Rivers, and should be identified and considered for preservation in its natural state;

h. Conesus lake waterfowl and wetland area;

i. Honeoye lake waterfowl and wetland area; and

j. Twenty-nine reservoirs for irrigation in the Ontario Lake plain.

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GENESEE RIVER BASIN STUDY. STUDY OF WATER AND RELATED LAND RESO--ETC(U)
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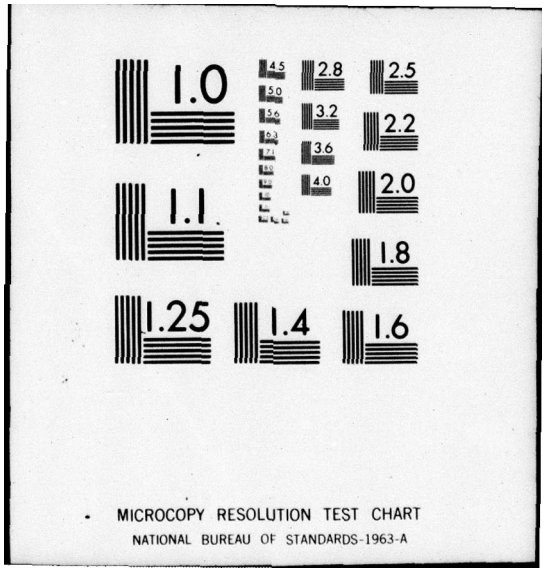
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RECOMMENDATION II

That the Stannard Reservoir Project, as included in the report of the Water Development Committee for Appalachia be included in the early-action plan. This project would have a beneficial effect on the unsatisfied needs of the early-action plan for the Genesee Basin.

RECOMMENDATION III

That refinement of the New York State portion of the basin plan contained herein be undertaken by the Genesee Basin Regional Water Resources Planning Board.

RECOMMENDATION IV

That the Portage Reservoir Project be placed in a "deferred category," because of the lack of supporting testimony at the public hearings and that the Genesee Basin Regional Water Resources Planning Board institute as may be appropriate, an investigation of project possibilities.

RECOMMENDATION V

That the long range plan for the future development of the Genesee Basin carefully consider the following items:

a. Tuscarora Reservoir, - in connection with a Letchworth State Park complex, should be investigated as a possible alternative to Portage Reservoir for water-oriented recreation and fishing;

b. Wiscoy Reservoir, in connection with a Letchworth State Park complex, should be investigated singly and in conjunction with Tuscarora Reservoir as a possible alternative to Portage Reservoir for water-oriented recreation;

c. Oatka Reservoir due to it's proximity to the Rochester metropolitan area should be investigated for an intensively-developed day use area. It should feature swimming, picnicking, sports and non-motor boating;

d. Sixty-seven upland reservoirs should be reviewed as potential sites to supply future needs;

e. Finger Lakes Trail System additions to connect the upper Genesee River, "3-River Rise" area and Allegany State Park;

f. Alma Pond, this natural area consisting of pond and wetlands noted for plant and bird life should be preserved in its natural state; and

g. Land Treatment Program continued until all lands requiring treatment are in a management program.

RECOMMENDATION VI

That the early-action plan be implemented as follows:

1. That authorization for three upland reservoir sites be sought by the Department of Agriculture in accordance with Public Law 566 which requires that appropriate applications be received from qualified local sponsoring organizations. That the Secretary of Agriculture be authorized to carry out the construction of thirty upland reservoir sites in accordance with the "Recommended Authorization for Carrying Out the Upland Program Genesee River Basin" as it appears in paragraph 272 and Volume VI, Appendix "J," page xxi. The estimated total cost for construction of these 33 upland reservoir sites would be $29,535,000, of which $14,165,000 would be the estimated Federal participation. The estimated annual benefits would be $3,744,400, with annual costs of $1,964,500, for a benefit-cost ratio of 1.9;

2. That land treatment measures for 111,000 acres of cropland, 42,000 acres of pasture, and 74,500 acres of forest land be implemented by the appropriate agencies of the Department of Agriculture. The estimated total cost of the land treatment program is as follows: $7,126,000 for cropland, $2,755,000 for pasture and $3,030,000 for forest land;

3. That authorization by the Congress for the Canaseraga Project be sought by the Corps of Engineers. The estimated total investment cost would be $7,699,000 of which $6,865,000 would be Federal participation. The total annual benefits are estimated at $392,800 and the total annual cost at $330,100 for a benefit-cost ratio of 1.2;

4. That development of the eight river access sites for boating and canoeing be implemented by the State of New York utilizing available Federal assistance; and

5. That the twenty-nine irrigation reservoirs in the Ontario Lake Plain Service area be implemented by the Department of Agriculture in accordance with Public Law 566. The estimated total would be $5,185,000 of which $2,593,000 would be Federal participation. The estimated total annual benefits would be $284,000 with an annual cost of $240,700 giving a benefit-cost ratio of 1.2.

RECOMMENDATION VII

1. That the State of New York adopt such legislation as may be required to clarify water rights law as related to irrigation, and to create the organizational and financial mechanisms necessary for implementation of the non-Federal aspects of the plan.

2. That the State of New York take appropriate action, using available federal assistance and programs, to promote implementation of the various structural and non-structural measures in this plan that are compatible with the plan to be developed by the Genesee Basin Board.

RECOMMENDATION VIII

That a survey be conducted and careful consideration be given to the many prehistoric and historic sites of archeological values along the general course of the Genesee River and its tributaries prior to authorization of reservoir projects.

RECOMMENDATION IX

That the acquisition of fishing easements or title in fee simple to lands along selected stream banks in the Genesee basin be continued. Emphasis should be placed on the continuance of this program as an essential element in meeting the needs for fishing opportunities by the year 1980. This acquisition should continue to be a part of the on-going program of the New York State Conservation Department, Division of Fish and Wildlife and the Pennsylvania Fish Commission.

RECOMMENDATION X

That the plan be reviewed and updated periodically.

AMOS L. WRIGHT, Chairman
COLONEL, Corps of Engineers
Department of the Army

FRANCIS W. MONTANARI
State of New York

MARK ABELSON
Department of the Interior

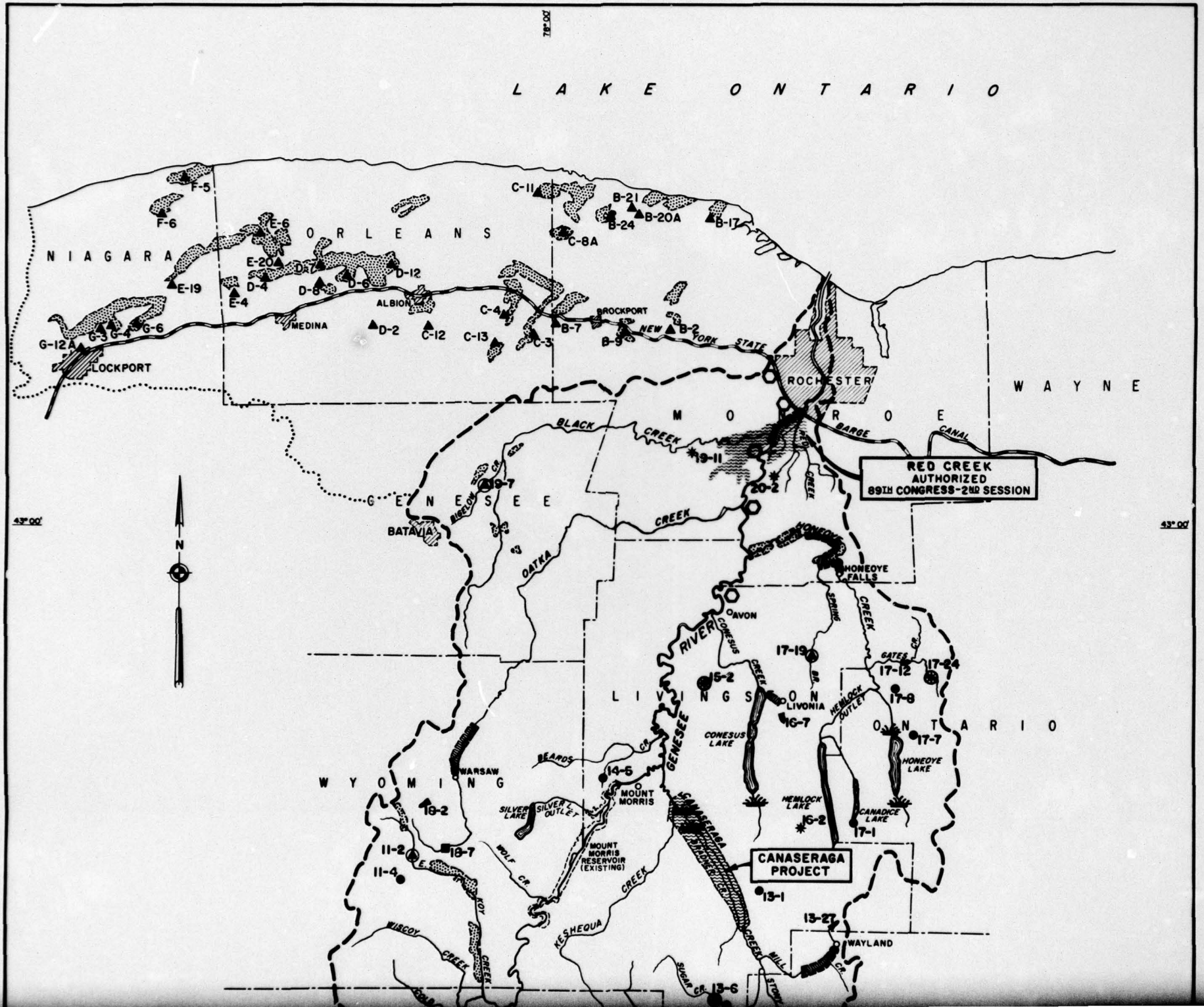
MAURICE K. GODDARD
Commonwealth of Pennsylvania

WALLACE L. ANDERSON
Department of Agriculture

RALPH J. VAN DERWERKER
Department of Health, Education and Welfare

GEORGE E. KIRK
Department of Commerce and
Department of Transportation

JOHN H. SPELLMAN
Federal Power Commission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BLACK CREEK
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20-2
RED CREEK
AUTHORIZED
89TH CONGRESS-2ND SESSION
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HONEOYE FALLS
AVON
GENESEE RIVER
CONESUS CREEK
SPRING CREEK
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LIVONIA
16-7
17-8
17-7
HONEOYE LAKE
HEMLOCK OUTLET
CONESUS LAKE
HEMLOCK LAKE
CANADICE LAKE
16-2
17-1
CANASERAGA PROJECT
13-1
13-27
WAYLAND
MILL CR.
STONY BROOK
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WARSAW
BEARDS CR.
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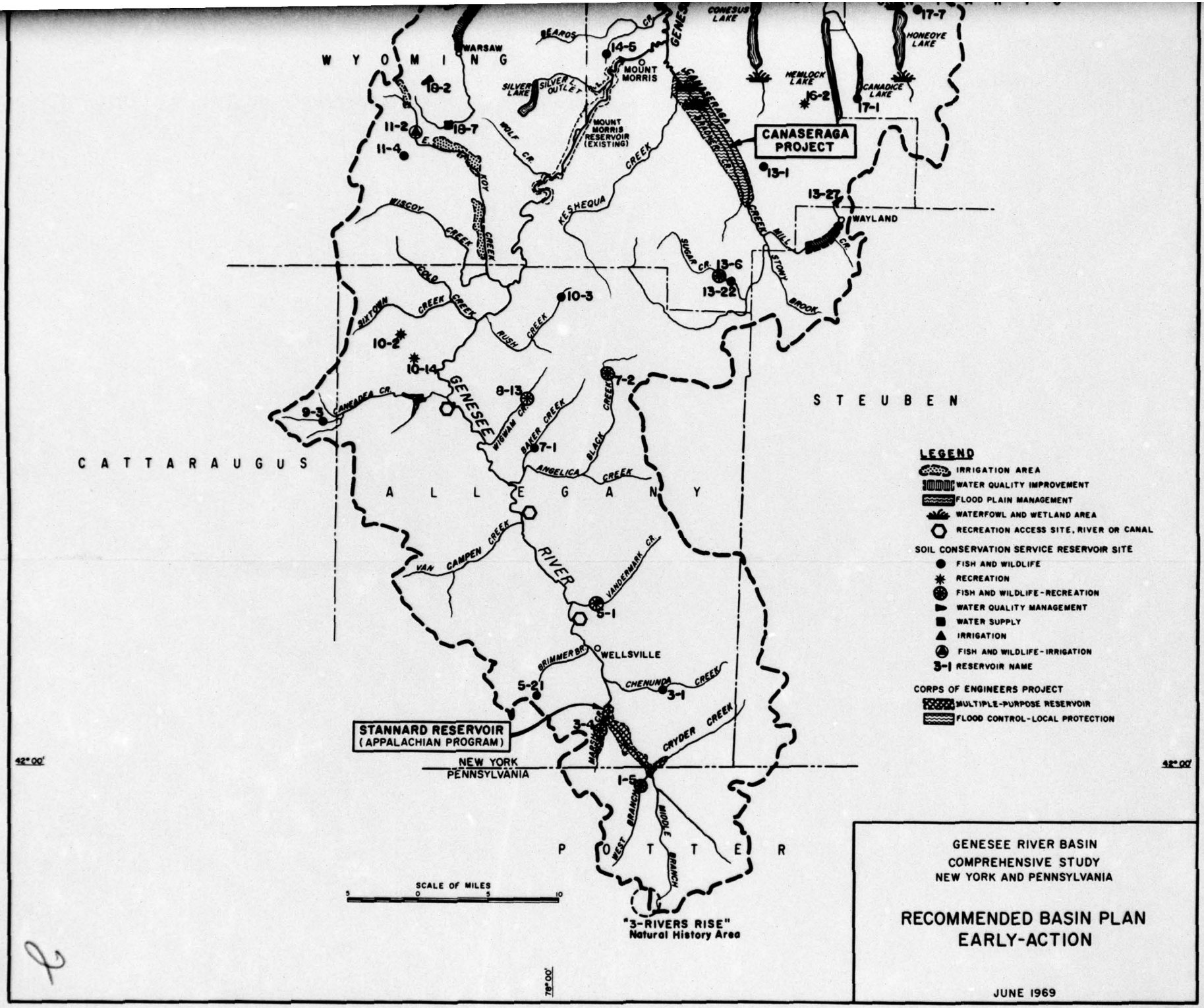
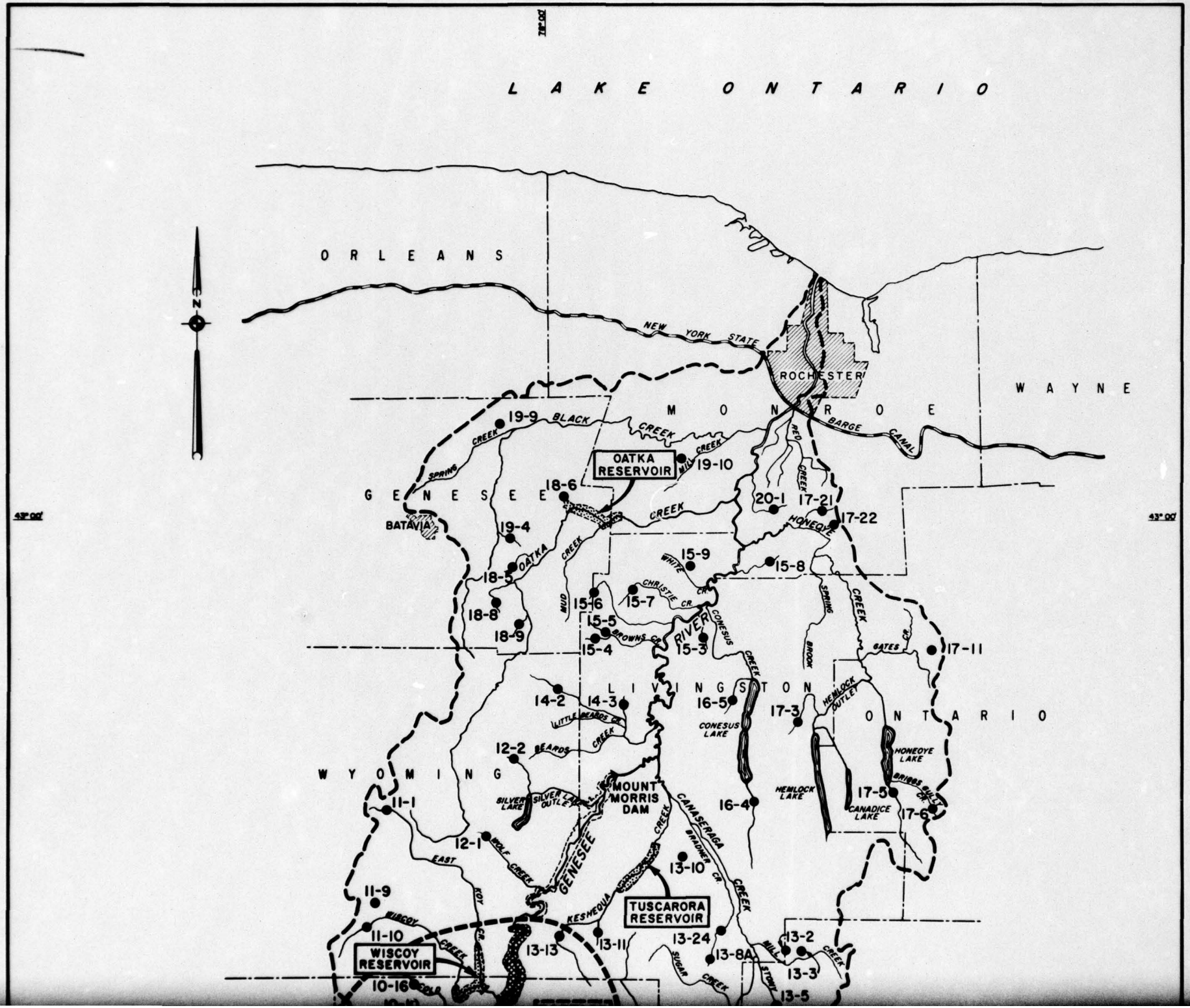


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

RECOMMENDED BASIN PLAN
EARLY-ACTION

JUNE 1969

PLATE 1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MOUNT MORRIS DAM
TUSCARORA RESERVOIR
WISCOY RESERVOIR
CONESUS LAKE
HONEOYE LAKE
HEMLOCK LAKE
CANADICE LAKE
GENESEE RIVER
BLACK CREEK
SPRING CREEK
OATKA CREEK
MUD CREEK
WHITE CR
CHRISTIE CR
BROWNS CR
CONESUS OUTLET
SPRING BROOK CREEK
GATES CR
HEMLOCK OUTLET
HONEOYE CREEK
RED CREEK
MILL CREEK
BEARDS CREEK
LITTLE BEARDS CR
SILVER LAKE
SILVER LAKE OUTLET
WOLF CREEK
EAST KOY CR
KESMEOVIA CREEK
CANASERAGA CREEK
BRADNER CR
SUGAR CREEK
STONY CREEK
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BRIGGS GULLY CR
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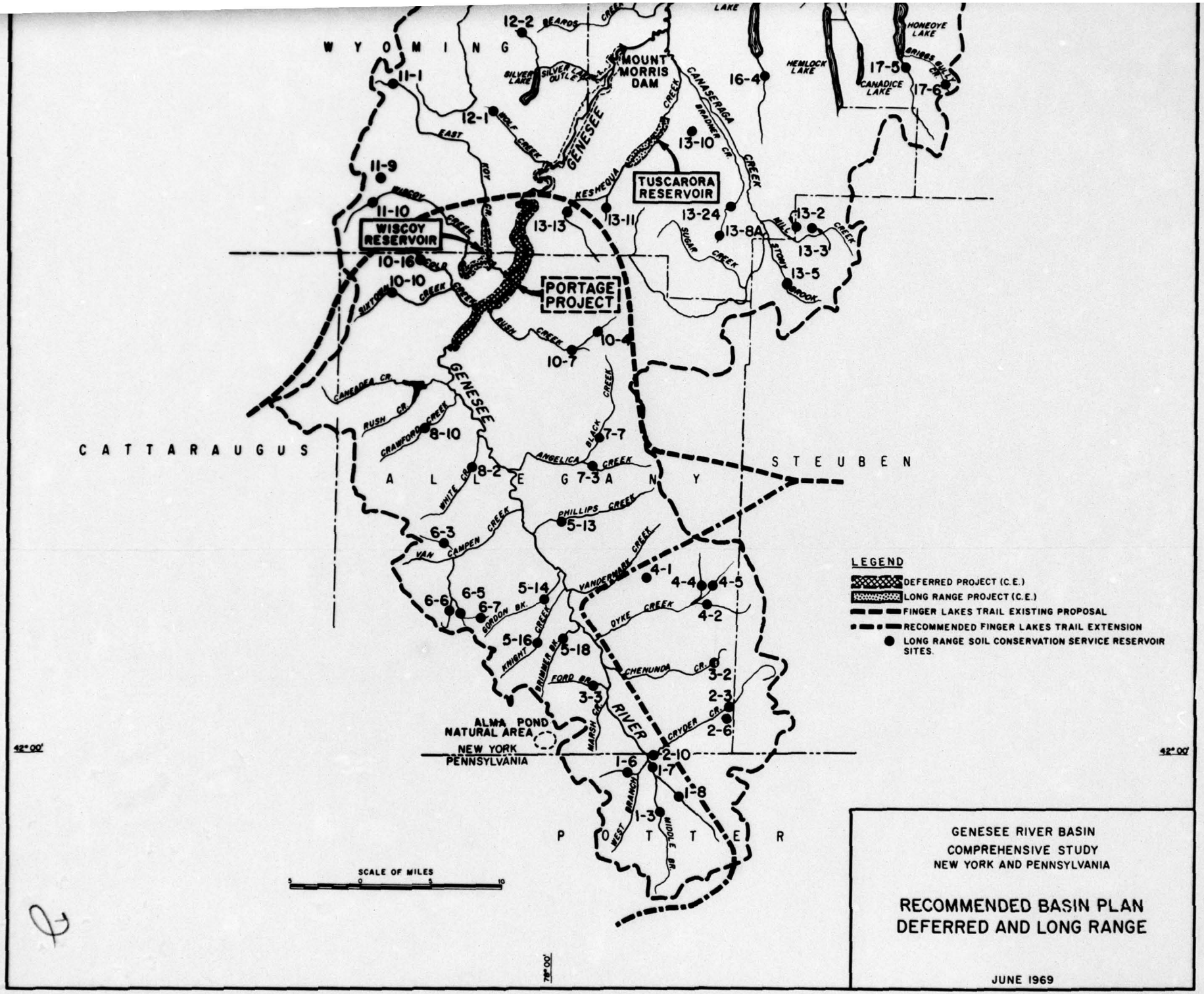
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PORTAGE PROJECT
ALMA POND NATURAL AREA
NEW YORK PENNSYLVANIA
GENESEE
GENESEE RIVER
CANASERAGA CREEK
BRADNER CR.
KESHEQUA CREEK
EAST KOY CR.
WOLF CREEK
BEARDS CREEK
SILVER LAKE
SILVER LAKE OUTLET
HEMLOCK LAKE
CANADICE LAKE
HONEOYE LAKE
BRIGGS GULLY CR.
BULLY STOWE BROOK
SUGAR CREEK
BURGEY CREEK
SIXTOWN CREEK
BUSH CREEK
CANEADEA CR.
RUSH CR.
CRAWFORD CREEK
BLACK CREEK
ANGELICA CREEK
WHITE CR.
PHILLIPS CREEK
VAN CAMPEN CREEK
VANDERMARK CREEK
GORDON BK.
KNIGHT CREEK
DRUMMER BK.
FORD BK.
OYKE CREEK
CHENUNDA CR.
MARSH CR.
CRYDER CR.
WEST BRANCH
MIDDLE BR.
12-2
11-1
12-1
11-9
11-10
10-16
10-10
10-4
10-7
8-10
8-2
7-7
7-3
6-3
6-5
6-6
6-7
5-14
5-16
5-18
5-13
4-1
4-4
4-5
4-2
3-2
3-3
2-3
2-6
2-10
1-6
1-7
1-8
1-3
16-4
17-5
17-6
13-10
13-11
13-13
13-24
13-8A
13-2
13-3
13-5
SCALE OF MILES
5 0 5 10
42° 00'
78° 00'
LEGEND
DEFERRED PROJECT (C.E.)
LONG RANGE PROJECT (C.E.)
FINGER LAKES TRAIL EXISTING PROPOSAL
RECOMMENDED FINGER LAKES TRAIL EXTENSION
LONG RANGE SOIL CONSERVATION SERVICE RESERVOIR SITES.
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
RECOMMENDED BASIN PLAN
DEFERRED AND LONG RANGE
JUNE 1969
PLATE 2

GENESEE RIVER BASIN STUDY

ADDITIONS TO SUMMARY REPORT

PREPARED FOR THE COORDINATING COMMITTEE
BY
THE BUFFALO DISTRICT, CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY

SEPTEMBER 1969

GENESEE RIVER BASIN STUDY

ADDITIONS
TO
SUMMARY REPORT

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GENESEE RIVER BASIN STUDY
ADDITIONS
TO
SUMMARY REPORT

PURPOSE

A1. This addition to the "Summary Report" Genesee River Basin Study is to briefly discuss changed conditions and/or criteria which would necessitate major revisions in the report. The Coordinating Committee felt that major changes should not be made at this late point in time owing to personnel and funding restraints. They desire this addition to act to alert those agencies that make later studies within the basin of the areas of change in the data presented in the "Summary Report" and appendices.

STANNARD RESERVOIR

A2. PHYSICAL DESCRIPTION

Stannard multiple-purpose reservoir site is located in the headwaters of the Genesee basin in Allegany County, New York and Potter County, Pennsylvania, and in Sub-region F of the Appalachian Region. The damsite is located about four miles south of Wellsville, New York controlling 165 square miles of drainage area. The location and pertinent data are given in Volume II, Appendix "C" of the Genesee River Basin report.

A3. Major physical features of the project would be the 2,300-foot long earth fill dam, a 190-foot wide gated spillway, approximately 1,600 feet of levee on Marsh Creek, and recreation areas with appropriate public-use facilities surrounding a reservoir having a total storage capacity of 97,500 acre-feet.

A4. CHANGE CONDITIONS

The Genesee River Basin Coordinating Committee early in the study concluded that project analysis would be oriented to the primary criterion of national economic efficiency as reflected in the comparison of tangible benefits and project costs, resulting from an economic base or historical trends projections. As a result, the Stannard Reservoir project was screened out of the "Recommended Early-Action Plan" for the basin as being economically unfeasible.

A5. The Genesee study was well underway when the counties, Allegany and Potter, in which the reservoir is located became part of the Appalachian Study. The data compiled for the reservoir during the Genesee study were given to personnel involved in the Appalachian Study. The project was evaluated using Appalachia criteria and found to be feasible.

A6. The Coordinating Committee at their tenth meeting, 10-11 June 1969 concluded that the impact of Stannard Reservoir on the Genesee River basin must be recognized even though it is not considered in their Early-Action plan. The reservoir will be a physical feature in the basin with a beneficial effect.

A7. PROJECT PURPOSES

The reservoir project has been planned to provide the services needed to satisfy the water related needs of the area, and thereby encourage development of the upper Genesee River Basin. The specific benefits realized from the project would be:

a. Flood damage reduction;

b. Water supply for industrial use and irrigation;

c. Water quality control;

d. Fish and wildlife enhancement;

e. Outdoor recreation opportunities; and

f. Economic development.

A8. The average annual flood damages to present and future developments between the reservoir site and Belmont, located approximately 15 miles downstream, would be reduced approximately 70 percent. Approximately one-third of the reservoir storage would be used to improve the quality of flows in the vicinity of Scio and outside of the Appalachian Region in the Gates-Chili-Ogden area, approximately 14 miles above the mouth of the Genesee River. Fish enhancement would be supplied for some 156,000 fisherman-days annually by the project through regulated releases for downstream trout fishery and through provision of a controlled, stocked reservoir with supporting facilities and access points around the reservoir. Limited hunting would be permitted wherever it would be consistent with safety of other recreationists and where adequate game might be available.

General outdoor recreation would be provided for about 233,000 users annually by furnishing adequate recreation facilities. By providing three downstream access sites white-water canoeing and small access site benefits for canoers and spectators would accrue to about 105,000 users annually. The Stannard project would provide a water supply for industrial developments. For instance, the project's releases could meet daily flows of 95 cfs for a pulp and paper mill, assuming the equivalent of good secondary treatment, and for supplemental irrigation of approximately 5,800 acres located in Allegany County, downstream of Wellsville. Economic development of the area of influence of the project would be supported through provision of additional job opportunities, both during and after project construction.

A9. COSTS AND BENEFITS

Costs for constructing Stannard Reservoir and the recreational facilities are estimated at 37.5 million dollars; annual charges are estimated to be $1,490,000. Comparable values for induced investments are 20.2 million dollars with annual charges of $1,180,000. Annual benefits for the development are estimated as follows:

	INCOME	
	National	Regional
	$	$
Users	2,145,000	1,708,000
Expansion effects		
Redevelopment	56,400	349,000
Development	380,600	5,161,000
Loss of income from lands taken for project	-54,000	-460,000

A10. Using the preceding, the index of performance of the objective of increasing national income would be 1.4, and for increasing regional income, 1.9.

A11. COOPERATION REQUIRED FOR CONSTRUCTION

The Corps of Engineers would construct the dam, reservoir and initial recreation facilities, and operate the dam. The State of New York would construct future recreation facilities and share in the construction costs of all of the recreation facilities. The State of New York would also operate and maintain all of the recreation facilities.

A12. The State of New York will be requested to provide assurances of local cooperation for cost sharing in the costs allocated to water supply and irrigation. Assurances for the irrigation costs would be furnished after local interests have formed the required "Irrigation Districts" with technical assistance supplied, if needed, by the United States Department of Agriculture.

A13. Prior to construction, local interests should furnish assurances that they will: establish encroachment lines to permit efficient reservoir operation; contribute to pollution control by providing adequate treatment or other waste control methods; to the full extent of their legal capability, exercise control against diversion of streamflow available for water quality control; and, within statutory limits, adopt and enforce floodplain management regulations to guide future developments within the floodplain away from locations which are threatened by flood hazards to minimize future flood damages.

A14. NEEDS THAT POTENTIALLY CAN BE MET BY STANNARD RESERVOIR

The needs which could be met by development of water and related land resources of the upper Genesee River by Stannard Reservoir under Appalachia-criteria are discussed briefly in the following paragraphs.

A15. With the conservation pool of the considered Stannard Reservoir project at elevation 1620, available flood control storage to top of gates elevation 1622 would be 4,000 acre-feet during the summer months. Available storage during the remaining months would depend upon the seasonal drawdown. The available storage in the Stannard Reservoir Project would significantly reduce the scale of flood damages expected to occur downstream in the absence of further flood protection, but will not completely eliminate the flood problem. Further, the project will increase the reliability of an existing local protective works, including a rectification of deficiencies, located downstream at Wellsville. The Stannard project would free for higher development uses desirable lands along the Genesee, downstream from the project site to Belmont.

A16. Available streamflow, augmented by releases from the Stannard project would satisfy downstream water supply and water quality needs for industrial developments and for supplemental irrigation of approximately 5,800 acres located in Allegany County, New York. Assuming the equivalent of good secondary treatment daily flows of 95 cfs would be required for a 100 to 125 ton per day pulp and paper mill. However, a plant three times this size could be developed from the resources available in the area. The 5,800 acres represent the irrigable lands in the Genesee River valley in Allegany County. A strong interest has not been shown by the local farmers for this practice to date. However, as irrigation

becomes economically feasible due to changing agriculture and other economic factors, this practice may become more applicable in the future. As the Appalachian plan should represent all interests and provide for the needs of the area, both present and future, it will be very desirable to allocate 5,800 acre feet of storage for future irrigation needs. This storage could be used for other purposes such as recreation until the time when it is needed for agricultural purposes.

A17. Low flow to meet BOD requirements for the Genesee River reach below the Gates-Chili-Ogden treatment plant would mainly be met by providing the flows required for a 100-to 125-ton per day pulp and paper mill. However, requirements for NOD would not be met. This is one of the criteria now being used in New York State to determine low flow requirements.

A18. The need for water-based recreation opportunity in Sub-region F of the Appalachian Region is expected to increase rapidly in the foreseeable future. Investigations by the Bureau of Outdoor Recreation reported in Appendix F, of the Report for Development of Water Resources in Appalachia, indicate that the need in recreation days in 1980 is 74.3 million; in 2000 is 176.6 million; and in 2020 is 408.4 million. The Recreation Task of the Genesee River Basin Study has indicated this same rapid increase for the water-based recreation. The recreation need for the Genesee is discussed in paragraphs 141 to 145 of the "Summary Report."

A19. CHANGES REQUIRED IN RECOMMENDED EARLY-ACTION PLAN

The inclusion of Stannard Reservoir in the Early-Action Plan for the Genesee River Basin would effect one Soil Conservation Service upland reservoir, site 3-4. This site is on Marsh Creek and would be inundated by the major damsite at Stannard. The site was considered for its aid in meeting the water-oriented recreation and fishing need in the upper Genesee basin. It would provide 97,300 recreation days and 17,000 fisherman days annually. It was considered as an alternate for Stannard Reservoir in the final stages of the Genesee study. The first cost of this site would be $2,194,000 with an annual cost of $112,700 and annual benefits of $117,900. This site is presently not eligible for construction by the Soil Conservation Service, under authority of Public Law 566.

A20. IMPACT ON GENESEE BASIN NEEDS

Stannard Reservoir would have an impact mainly on the unsatisfied demand in the field of outdoor recreation, fish and wildlife and water quality. The following table presents a comparison between the Early-Action plan as recommended in the "Summary Report" and the Early-Action plan including Stannard Reservoir.

Demands met by early-action plan

Needs	1980			2020		
	Existing or Projected Program	Early-Action Plan (1) (Recommended)	Early-Action Plan with Stannard Reservoir (1)	Existing or Projected Program	Early Action Plan (1) (Recommended)	Early-Action Plan with (1) Stannard Reservoir
Recreation (Market Area)	65%	72%	73%	45%	48%	48%
Fish & Wildlife (Influence Area)	35%	63%	70%	33%	48%	52%
Water Quality (Critical Sectors)	78% (2)	96%	100%	78%	96%	100%
Water Supply	100%	100% (3)	100%	100%	100%	100%
Irrigation						
Basin	36%	52%	52%	17%	25%	45%
Lake Plains	41%	138% (4)	138% (4)	20%	67%	67%
Power	0%	0%	Minor	0%	0%	Minor
Flood Control(Major Problem Areas):						
Local Protection	80% (5)	100% (5)	100%	80%	100%	100%
Flood Plain Management	100%	100% (6)	100%	100%	100%	100%
Land Treatment						
Croplands	36%	36% (7)	36%	98%	98% (7)	98%
Pasture	27%	27% (7)	27%	98%	98% (7)	98%
Forest	17%	27%	13%	67%	78%	78%
Erosion (Streambank Control)	2%	2%	+ 2%	2%	2%	+ 2%

(1) Percentage demand satisfied, including the existing or projected programs.
(2) Based on existing 23 critical sectors in the Basin, 18 of these sectors can be corrected by secondary treatment facilities.
(3) Water supply for Warsaw provided.
(4) Capability exceeds demand during early-action period (to 1980).
(5) Based on 5 major flood control projects in Basin, thus reducing damages in the only major flood damage areas of the Basin.
(6) Flood Plain Management program was initiated for Black Creek area during late stage of comprehensive study.
(7) No major acceleration of existing programs are anticipated.

WATER QUALITY

A21. GENERAL

The parameters investigated to establish water quality characteristics by the water quality task group included dissolved oxygen, BOD, acidity, temperature, dissolved solids and color. Standards were established by New York and Pennsylvania in accordance with the Water Quality Act of 1965 subsequent to the time of the task group investigations.

A22. BASIN STUDY STANDARDS

The major standards used in the Genesee study were as follows:

a. A dissolved oxygen (DO) concentration of 4.0 milligrams per liter, as minimum acceptable;

b. Projected waste loadings computed assuming 85 percent treatment in 1980 and 90 percent in 2020; and

c. Minimum or design flow of 7-consecutive-day, 1-in-10-year flow.

A23. CHANGE IN STANDARDS

It should be noted by those persons interested in the water quality management portions of this report that subsequent to completion of Appendix "H," Water Quality Management, standards were accepted and approved by the Secretary of the Interior in accordance with the requirements of the Water Quality Act of 1965 for New York and Pennsylvania.

A24. The major changes in standards for New York State are a minimum acceptable dissolved oxygen (DO) concentration of 5.0 milligrams per liter for all trout waters and a minimum or design flow of 7-consecutive-day, 1-in-50-year flow.

A25. The change in standards for Pennsylvania involve a dissolved oxygen (DO) concentration level of 6.0 milligrams per liter as a minimum daily average and no value less than 5.0 milligrams per liter for waters in the Genesee River basin.

A26. NITROGENOUS OXYGEN DEMANDS

In addition to the parameters investigated to establish the water quality for this study, the State of New York is now also

evaluating the Nitrogenous Oxygen Demands (NOD) which can represent a problem in dry weather streams.

A27. Although the NOD data are not given in any tables for the study, evaluation of the Allegany County Comprehensive Sewage Study Report indicates that the following area will require advanced treatment when the sewerage projects are implemented.

Stream Sector	% Removal by 2020	
	BOD	NOD
Canadea Creek		
Rushford	92.0	78.0
Canaseraga Creek		
Canaseraga	95.0	75.0
Dyke Creek		
Andover	96.0	85.0
Genesee River		
Wellsville	90.0	85.0
Van Campen Creek		
Friendship	91.0	86.0

The above data on proposed sewerage projects were developed subsequent to completion of Appendix "H." *The data should be helpful for future* studies of the Genesee Basin Board.

A28. BENEFITS FOR PORTAGE RESERVOIR

The benefits for Portage Reservoir as shown in table 42 of this "Summary Report" include water quality benefits for the Avon stream sector and the stream sector below the Gates-Chili-Ogden area in the total amount of $138,000. The annual costs for the alternatives, advanced treatment, would be $55,000 for the Avon sector, $101,000 for the Gates-Chili-Ogden sector and $138,000 for a combination of two upland reservoir sites to supply the required low flow for the two critical sectors above. A breakdown of costs and benefits is contained in Appendix "B," Plan Formulation, Section IV, paragraph 23.

A29. Additional studies by the New York State Department of Health and F.W.P.C.A. subsequent to the completion of Appendix "B," Plan Formulation and the October 1967 public hearings indicate capacities more than double the original estimate or about 5,400 lbs/day for the Avon stream sector. This was due to a combination of higher minimum average consecutive 7-day, 1-in-10 year flows, as determined by the U.S.G.S. and higher assimilative rates.

A30. In view of the decision of the Coordinating Committee to place the Portage Reservoir project in a "Deferred" category, the water quality benefits as shown in table 42 have not been revised. The revised benefits would require the deletion of benefits for the Avon stream sector. Thus reducing the water quality benefits from $138,000 to a maximum of not more than $101,000 and possibly making advance treatment for the Gates-Chili-Ogden area the most feasible alternative.

HEALTH ASPECTS

A31. It is highly desirable to alert those interested in this basin study that recent broadened concept of the "Public Health Aspects of the Water Resources" development planning have not been included in our proposed projects. These broadened aspects must be given proper consideration and included during the detailed planning of any project undertaken as a result of this study. The Public Health Service, Department of Health, Education and Welfare must be consulted in the following areas of concern:

(a) Vector control measures both in the construction and operation of projects;

(b) Epidemiology of water born diseases; and

(c) Sanitary survey of water and related land resources.

TOTAL PROGRAM COSTS

A32. The State of New York at the request of the Coordinating Committee investigated capital costs for other anticipated programs within the Genesee River Basin study area by the year 1980. It was felt that the cost of programs for water supply, water quality and recreation not previously covered in the Coordinating Committee report should be stated to indicate the general level of Federal and non-Federal investments in the area. The data concerning other costs in the water resources field are given in the following table. These data were compiled from sewerage and water supply figures based primarily on county consultant study reports, sponsored by the New York State Health Department. The recreation figures are based on data from the New York State Conservation Department, Division of Parks.

Additional Projected Water Resources Investments to Year 1980

Function	Estimated Total Capital Cost	Estimated Capital Cost Federal Participation
Water Supply	$ 82,000,000 (1)	---
Water Quality	366,600,000 (2)	$15,900,000 (4)
Recreation	146,600,000 (3)	64,000,000 (5)
TOTAL	$595,200,000	$79,900,000

(1) Public water supply costs for entire counties of Allegany, Genesee, Livingston, Monroe and Wyoming.
(2) Municipal sewerage costs for entire counties of Allegany, Genesee, Livingston, Monroe and Wyoming.
(3) Public recreation land and facilities costs for Genesee River Basin Recreation Market Area.
(4) Based on eligible first investment cost and current federal procedures.
(5) Based on assumed 50 percent federal share of facility first investment cost, and current federal land grant procedures.

A33. Thus the overall short-range investment in water resources for the Genesee River Basin and service areas would be the cost of the recommended Early-Action program of this study with revisions as stated in paragraph A19 and the cost from the preceding table. The combined investment costs are shown in the following table.

Summary of anticipated water resource costs for the Genesee River Basin to year 1980

Development	Estimated Total Cost	Estimated Cost Federal Participation
EARLY-ACTION PLAN		
32 Upland Reservoir Sites	$ 27,341,000	$ 13,068,000
Land Treatment	12,911,000	-
Canaseraga Multiple-purpose	7,699,000	6,865,000
Flood Plain Management (Black Creek)	26,000	26,000
Hemlock Lake Recreation Area	(1)	(1)
Canadice Lake Recreation Area	(1)	(1)
8 Recreation Access Sites	1,600,000	800,000
"3-River Rise," Natural History Area	300,000	150,000
Conesus Lake Wetland Area	540,000	270,000
Honeoye Lake Wetland Area	1,000,000	500,000
SUB-TOTAL BASIN	$ 51,417,000	$ 21,679,000
29 Reservoirs - Ontario Lake Plains	5,185,000	2,593,000
SUB-TOTAL EARLY-ACTION PLAN	$ 56,602,000	$ 24,272,000
APPALACHIA PROGRAM		
Stannard Multiple-Purpose Reservoir	$ 37,500,000	$ 31,352,000
TOTAL EARLY-ACTION PLAN	$ 94,102,000	$ 55,624,000
OTHER PROJECTS IN NEW YORK STATE		
Water Supply	$ 82,000,000	$ -
Water Quality	366,600,000	15,900,000
Recreation	146,600,000	64,000,000
GRAND TOTAL	$689,302,000	$135,524,000

(1) No Estimate.

INTEREST RATES

A34. BASIN STUDY RATES

An interest rate of 3-1/8 percent was the accepted rate during most of the study for both Federal and non-Federal costs. The only project evaluation that differs from the 3-1/8 percent interest rate is the Portage project in which 3-1/4 percent rate was used since it was in effect at the time of project evaluation.

A35. The Coordinating Committee has discussed the recent revised interest rates approved by the Water Resources Council. It is their consensus that this study should remain with the original 3-1/8 percent interests on all projects, preliminary and survey scope, thus all projects can be compared on a common basis. It is recognized that for any project in the early-action plan which an authorization report is to be prepared, it must be re-evaluated using 4-7/8 percent interest rate or the proper rate at the time of submission of the authorization report.

A37. The above decision of the Coordinating Committee is in accordance with EC 1165-2-77, paragraph 5, dated 3 September 1969.

A38. IMPACT OF NEW RATES

A review of most of the Corps of Engineers reservoir projects investigated during the study indicates an unfavorable benefit to cost ratio using the then current rate of 3-1/8 percent. The new rates without modification of benefit methods would probably make the benefit to cost ratio even more undesirable. However, benefits would have to increase because some of them are based on alternative costs which are influenced by the same interest rates. The Portage multiple-purpose project which was placed in the "Deferred" category had a 1.4 to 1 ratio using an interest rate of 3-1/4 percent. A rate of 4-7/8 percent would probably produce a benefit to cost ratio at or less than unity. The comparability ratio for power on the Portage project was essentially unity with 3-1/4 percent interest. Thus with the revised interest, it is doubtful if power could be a justified purpose.

A39. In the case of the Soil Conservation Service, Upland Reservoir sites in the proposed Early-Action plan most have a benefit to cost ratio considerably above unity. Therefore, the revised interest rate should have minor effect on the justification of most of the upland sites.

A40. Therefore, the impact of the new interest rates will be minor on the proposed Early-Action plan due to the projects included in the plan. The greatest effect will be on the Canaseraga multiple-purpose flood control and waterfowl habitat improvement project which is discussed in subsequent paragraphs.

A41. The impact of the new interest rate may be grave on the "Deferred" category, Portage multiple-purpose reservoir project. This impact may be reduced or eliminated as a result of the Coordinating Committee's, Recommendation IV, which requests the Genesee Basin Board to institute as may be appropriate, an investigation of project possibilities

A42. EFFECT ON THE CANASERAGA PROJECT

The Canaseraga multiple-purpose project is the only major project in the Early-Action that could be adversely affected by the increase in interest rates. The Canaseraga is a local flood control and waterfowl habitat improvement project. The total cost of the proposed project in the "Summary Report" is $7,699,000. It was evaluated at an interest rate of 3-1/8 percent and had a benefit to cost ratio of 1.2 to 1.0.

A43. On the basis of evaluating the project from the standpoint of interest rates only, a rate of 4-7/8 percent would result in a benefit to cost ratio of 0.85 to 1.0. This impact on the Early-Action plan has been discussed by the Coordinating Committee at their tenth meeting. The possibility of re-evaluating the potential benefits at the time of preparation of the "Authorization Report" by the Corps of Engineers was considered by the Coordinating Committee. It was the consensus of the members that the Canaseraga project should remain in the proposed Early-Action plan for the basin. The more detailed benefit analysis for the "Authorization Report" phase probably will indicate the project is still feasible.

A44. There are several possibilities for increasing the benefits for the project. The value for the waterfowl habitat improvement was based on an alternative cost for providing the same waterfowl habitat at a single-purpose location. Thus the increase interest rates would increase the cost of the alternative single-purpose location and increase the benefit value per duck use day. The growth period for ultimate use by waterfowl, hunters and birdwatchers could be restudied along with the type of growth curves to be used. These factors would require additional study by Fish and Wildlife Service of the Department of the Interior.

A45. In order to demonstrate some of the possibilities for increased fish and wildlife benefits, the following table of potential revisions is

Estimate of Annual Benefits and Cost for the Proposed Canaseraga Multiple-Purpose Project

	Summary Report Evaluation	Impact of Revised Interest Rate	Revised Value of Duck use days	Revised Value of Duck use days & growth period	Revised Value of Duck use days & Type of growth curve	Revised Value of Duck use days & Type of growth curve
Total ultimate dollar value with project	$.124/duck $346,900	$.124/duck $346,900	$.15/duck $419,600	$.15/duck $419,600	$.15/duck $419,600	$.16/duck $447,500
Without the project dollar value	122,300	122,300	148,000	148,000	148,000	157,900
Maximum annual amount to be discounted	224,600	224,600	271,600	271,600	271,600	289,600
Growth period	15 yrs.	15 yrs.	15 yrs.	10 yrs.	15 yrs.	15 yrs.
Annual interest rate	3-1/8%	4-7/8%	4-7/8%	4-7/8%	4-7/8%	4-7/8%
Type of growth curve considered	Straight line	Straight line	Straight line	Straight line	Accelerate	Accelerate
Average annual benefit	171,220	158,200	191,400	216,100	224,800	239,700
Total dollar value with the project	$ 52,500	$ 52,500	$ 52,500	$ 52,500	$ 52,500	$ 52,500
Without the project dollar value	17,500	17,500	17,500	17,500	17,500	17,500
Maximum annual amount to be discounted	35,000	35,000	35,000	35,000	35,000	35,000
Growth period	15 yrs.	15 yrs.	15 yrs.	10 yrs.	15 yrs.	15 yrs.
Annual interest rate	3-1/8%	4-7/8%	4-7/8%	4-7/8%	4-7/8%	4-7/8%
Average annual benefit	$ 26,680	24,700	24,700	27,900	29,000	29,000
Total Fish & Wildlife Benefits	$197,900	$182,900	$216,100	$244,000	$253,800	$268,700
Flood control benefits	194,870	194,900	194,900	194,900	194,900	194,900
Total benefits	392,700	377,800	411,000	438,900	448,700	463,600
Total cost	330,060	444,300	444,300	444,300	444,300	444,300
B/C Ratio	1.19	0.85	0.93	0.99	1.01	1.04

Estimated equivalent average annual birdwatching and hunting benefits

Estimated equivalent average annual habitat benefits

presented for comparison of possible change conditions from the "Summary Report." It should be noted, that it is possible to obtain a benefit to cost ratio of unity with revisions to only the fish and wildlife benefits under certain revised conditions.

A46. The flood control benefits for the project are a combination of benefits derived from a reduction of flood losses, changed land use and more intensive land use. Each of these three categories should be re-investigated by the Corps of Engineers and the Soil Conservation Service. It is certain that the category of "reduction of flood losses" would increase, but the magnitude is unknown at this time.

A47. In view of the Appalachian Studies program, there is a possibility that expansion type benefits or secondary benefits may be acceptable by the time an "Authorization Report" is prepared. The category of "more intensive land use" would produce an estimated increase of 8,360 tons of crops which would result in an increase workloads for the regional cannery industry. The magnitude of this crop increase and added wages to the regional economy is shown in the following table.

Estimated Crop Increase Due to Flood Control

Crop	Increase Crop		Increase Labor	
	Acres	Tonnage	Hours	Wages
Beets	400	4,800	55,000	$ 90,800
Peas	400	600	7,000	11,600
Snap Beans	400	560	6,000	9,900
Sweet Corn	400	2,400	28,000	46,200
TOTALS	1,600	8,360	96,000	$158,500

A48. The above data should show that the conclusion of the Coordinating Committee with respect to the Canaseraga multiple-purpose project is warranted at this time.

MISCELLANEOUS

A49. The recommendation of the Coordinating Committee concerning Flood Plain Management for the Black Creek area on the lower Genesee River was presented at the October 1967 public hearings. As a result of this recommendation, the towns involved requested through the New York State Conservation Department, Division of Water Resources, the Corps of Engineers to prepare a Flood Plain Information Report for the towns of Chili and Riga, Monroe County, New York. This report is scheduled for presentation to the involved towns on 25 March 1970.

A50. The Commonwealth of Pennsylvania in their comments on the three proposals in the "Early-Action" plan involving projects in, or affecting, their commonwealth, made the following statements;

(a) In connection with the Stannard Reservoir Project, we note that non-Federal costs on this project amounts to $6,150,000. Because we see little direct benefits to the Commonwealth of Pennsylvania in connection with this project, we cannot recommend that the Commonwealth enter into cost-sharing arrangements for this project;

(b) With regard to the recommendation concerning the "3-Rivers Rise," Natural History Area being included in the Statewide Comprehensive Outdoor Recreation Plan, "No proposal of this type is contained in Pennsylvania's Statewide Comprehensive Outdoor Recreation Plan and none is anticipated;" and

(c) A reservoir for recreation purposes, 1-5, is proposed in Potter County, Our analysis of recreational demand within the State shows adequate State recreation land and facilities in the Potter County area, and consequently, we do not envision the inclusion of this proposed area in our Statewide plan.